THE FISHES
OF THE
INDO-AUSTRALIAN ARCHIPELAGO
XI

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THE FISHES OF THE INDO-AUSTRALIAN ARCHIPELAGO.

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THE FISHES
OF THE
INDO-AUSTRALIAN ARCHIPELAGO

BY

Prof. Dr. MAX WEBER † and Prof. Dr. L. F. DE BEAUFORT

XI

SCLEROPAREI, HYPOSTOMIDES, PEDICULATI PLECTOGNATHI, OPISTHOMI, DISCOCEPHALI XENOPTERYGII

with 100 illustrations

BY

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Formerly Professor at the University and Director of the Zoological Museum of Amsterdam

AND WITH THE COLLABORATION OF

JOHN C. BRIGGS
University of Texas. Institute of Marine Science

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INTRODUCTION

This volume comprises the account of the Scleroparei, Hypostomides, Pediculati, Plectognathi, Opisthomi, Discocephali, and Xenopterygii. Herewith that of the Teleostei is brought to a conclusion. A volume on the sharks and rays ought to follow, as was planned originally. As it is impossible to study this group at the hand of the scanty material in museum collections, it was arranged that this last volume should be written in colaboration with an ichthyologist in Indonesia, who could examine large specimens in the fishmarkets. For the moment this is not possible and so Vol. XII has to wait for better days.

I think it unnecessary to repeat what has been said in the introductions of the Volumes II-VIII about the way measurements have been taken. A somewhat different way of measurements has been adopted by Mr. John C. Briggs (see p. 345), whose help in giving an account of the Xenopterygii it is a pleasure to acknowledge.

I am grateful to: Dr. F. P. Koumans, Dr. M. Boeseman (Leiden Museum), Dr. Ethelwynn Trewavas, Mr. N. B. Marshall, A. Fraser-Brunner, D. Tucker (British Museum), the late Prof. L. Bertin (Paris Museum) for their help when I visited these museums.

Most of the figures in this volume have been drawn in former years by Mr. J. F. Obbes, whose beautiful drawings adorn all former volumes of this series too, but now, at the age of over 90, his hands have lost their steadiness, so I had to look out for other sources. Several figures have been reproduced from other works, as acknowledged in the legends, and I am greatly indebted to the editors and authors who gave me permission to do so. Still there were figures missing and I ventured to draw them myself. Although they do by far not attain the perfection of Obbes's drawings, I hope they will serve the purpose.

Finally I gladly avail myself of this opportunity to thank Mr. F. C. Wieder, Director of the Printing and Publishing Firm E. J. Brill Ltd. of Leiden, for his interest and help.

Amersfoort L. F. de Beaufort
August, 1962

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Order SCLEROPAREI

Airbladder without open duct. Parietals separated by the supraoccipital. No orbitosphenoid. Suborbitals forming a bony stay for the preopercle, to which the third one is attached in different manners. Preopercle generally with some strong spines along its hindborder. Opercle typically with two divergent ridges, ending in spines. Bony ridges on prefrontal, frontal, parietal, pterotic, and posttemporal generally developed, often bearing rows of spines. Dorsal as a rule consisting of a spinous and a soft part. Anal as a rule with a few spines. Pectorals often with a broad base, one or more of the lower rays sometimes detached. Ventrals thoracic, typically with a spine and five rays, but often with less rays and sometimes rudimentary. Ctenoid or cycloid scales present, or scales totally absent. Dentition generally feeble, without large canines.

Note. The bony ridges and their spines on the head of the *Scleroparei* are of taxonomic importance. I have used the following names: Supraorbital ridges on the frontals along the superior orbital rim, often continued into superior postorbital ridges on the parietals which are flanked by the inferior postorbital ridges on the pterotics and ending on the posttemporal. Suborbital ridges on the suborbitals.

Key to the Indo-Australian families of Scleroparei

- A. Second orbital rigidly attached to first. Pectoral base subvertical, often procurrent below. *Scorpaenoidea*.
  - I. Spinous part of D longer than soft part.
    - a. Gill membranes free from isthmus.
      - a^1. Three, rarely two pungent anal spines . . . . 1. *Scorpaenidae* p. 2.
      - b^1. Three flexible anal spines . . . . 2. *Aploactidae* p. 90.
    - b. Gill membranes united to isthmus.
      - a^1. Anal spines flexible. Gill opening small . . . . 3. *Bathyaploactidae* p. 91.
      - b^1. Two or three pungent or flexible anal spines. Gill opening large. . 4. *Synanceidae* p. 93.
  - II. Spinous part of D shorter than soft part, the two parts sometimes separated.
    - a. Gill membranes free from isthmus.

a^{1}. Two or three lower pectoral rays free and more or less rod-like. Anal with one pungent spine or without spine . . . . 5. *Triglidae* p. 114.
b^{1}. No free pectoral rays. Anal with one spine. Head much depressed . 6. *Platycephalidae* p. 127.
b. Gill membranes attached to isthmus.
a^{1}. Ventrals not rudimentary. Body not much compressed.
a^{2}. Three or four of the lower pectoral rays free. Body and tail depressed, with bony plates. 7. *Hoplichthyidae* p. 166.
b^{2}. No free pectoral rays. Body naked . . . . 8. *Cottunculidae* p. 167.
b^{1}. Ventrals rudimentary. Body much compressed . . . . 9. *Caracanthidae* p. 169.
B. Second orbital movably articulated with first and with preopercle. Pectoral base very long *Dactylopteroidea* . . . . 10. *Dactylopteridae* p. 173.

1. Family SCORPAENIDAE

Compressed. Head, body, and tail scaled or head naked and body and tail either naked or with rudimentary scales. Two pairs of nostrils. Head often with body ridges which are spiny or not. Spinous part of dorsal longer than soft part. Anal with III pungent spines, exceptionally with II. Ventrals with a spine and 2-5 rays. Pectorals well developed, sometimes extremely long; exceptionally one of the lower rays is free. Gill membranes free from isthmus. Vertebrae 24-40. Ribs present at least on posterior precaudal vertebrae.

Key to the Indo-Australian genera of Scorpaenidae

A. Head at least with some scales on preopercle and opercle. Body and tail scaled.
I. Membranes of dorsal not inserted on base of spines only. Pectorals not reaching to anal or beyond.
a. Upper part of head with spiny ridges. Scales generally ctenoïd.
a^{1}. Twelve dorsal spines.
a^{2}. Lateral line only slightly developed on several anterior scales . . . . 1. *Phenacoscorpius*, p. 5.
b^{2}. Lateral line complete.
a^{3}. A quadrangular pit on upper part of head, behind eyes. Head scaleless, excepting

some scales on opercle and preopercle.

a⁴. Teeth on vomer and palatines. Pectoral rays simple or upper ones divided . . . . 2. *Parascorpaena,* p. 7.

b⁴. Teeth on vomer, none on palatines. Upper pectoral rays divided, lower simple . . . . 3. *Scorpaenopsis* p. 12.

b³. No pit behind eyes. Sides of head scaly, sometimes also occiput. Teeth on vomer and palatines. Upper pectoral rays divided, lower simple or all simple . . . . . . 4. *Sebastapistes* p. 23.

b¹. Thirteen dorsal spines. Teeth on vomer, none on palatines. Upper pectoral rays divided, lower simple . . . . 5. *Scorpaenodes* p. 30.

b. Upper part of head scarcely spiny. Scales cycloid. Twelve dorsal spines . 6. *Setarches* p. 35.

II. Membranes of dorsal spines inserted on base only of anterior side of spines. Pectorals reaching on anal or beyond.

a. Anal with three spines. Caudal rounded or somewhat pointed and without prolonged rays . . . . 7. *Pterois* p. 37.

b. Anal with two spines. Caudal truncate, the outer rays filamentous . . . . 8. *Parapterois* p. 52.

B. Head without scales. Body and tail scaly or naked.

a. Dorsal with 11 spines, anal with 2 spines. A long, branched tentacle above eye. Body

b. Dorsal with more spines. If with 11 spines 9. *Pteroidichthys* p. 54.

scaly . . . .

there are 3 anal spines, or there are no scales.

a¹. Pectorals long, inferiorly with a rod-like free ray . . . . 10. *Apistus* p. 55.

b¹. No free pectoral rays.

a². Much compressed. Height 2. Rudimentary scales, each with a minute spine posteriorly. D.XII.11. 11. *Taenianotus* p. 57.

b². Not much compressed, or height more than 2.

a³. Scales totally wanting, but body often covered with more or les distinct tubercles.

a^{4}. No teeth on palatines.

a^{5}. Origin of D. above eye. A. II-III. 7-11. V. I. 2-3 . . . . 12. *Erisphex* p. 59.

b^{5}. Origin of D. above opercle. A. III. 5. V. I. 5. . . . . 13. *Scorpaenella* p. 63.

b^{4}. Teeth on palatines. A. III. 5-6. V. I. 5.

a^{5}. Origin of D. well behind eye. D. XII-XIII. 9-10. A cleft behind the 4th gill. 14. *Gymnapistus* p. 64.

b^{5}. Origin of D. above eye. D. XIII. 7-8. No cleft behind 4th gill . . . . . . 15. *Tetraroge* p. 67.

b^{3}. Scales present, at least on part of the body.

a^{4}. Three anterior dorsal spines remote from rest of fin with which they are connected by a very low membrane only. Mouth very oblique, lower jaw the longer with a symphysial knob . . . . . . 16. *Vespicula* p. 71.

b^{4}. Three anterior dorsal spines not remote from rest of fin, or, if so, connected by well developed membrane with rest of fin.

a^{5}. Anterior dorsal spines much longer than the following. Dorsal fin membrane not incised. 17. *Amblyapistus* p 75

b^{5}. Anterior dorsal spines not much longer than the following. Dorsal fin membranes incised.

a^{6}. Palatine teeth present.

a^{7}. Origin of dorsal immediately behind eye V. I. 5. A. III. 7 . . 18. *Neocentropogon* p. 78.

b^{7}. Origin of dorsal above eye. V. I. 4. A. III. 4-5. 19. *Paracentropogon* p. 80.

b^{6}. Palatine teeth wanting. Origin of dorsal before or above anterior part of eye.

a⁷. V. I. 4.
  - a⁸. Anterior profile of head convex. Dorsal and anal connected to caudal peduncle by membrane . 20. *Cottapistus* p. 84.
  - b⁸. Anterior profile of head straight. Dorsal and anal not connected with caudal peduncle . 21. *Sibogapistus* p. 85.

b⁷. V. I. 5. Anterior profile of head with a concavity before eye. Dorsal and anal connected with caudal peduncle by membrane . 22. *Snyderina* p. 88.

Phenacoscorpius Fowler

(Fowler, Proc. U.S. Nat. Mus. LXXXV, 1938, p. 69)

Body compressed, back but little elevated. Head large, compressed, scaly. Snout short. Eye large. Teeth in villiform bands in jaws and vomer, present or absent on palatines. Gill opening wide, membranes scarcely united, free from isthmus. Pseudobranchiae well developed. Spines of head strongly developed. Scales large, feebly ctenoïd. Lateral line very short, only slightly developed on several anterior scales. Dorsal with XII spines and 9 rays. Anal with III spines and 5 rays. Lower 8-11 pectoral rays simple. Ventrals with a spine and 5 rays. Caudal rounded.

Distribution: Two species known, one from the Philippines and East Indies, the other from the Gulf of Aden, in depths from 37-366 fathoms.

1. **Phenacoscorpius megalops** Fowler (Fig. 1, p. 6)

Phenacoscorpius megalops Fowler, Proc. U.S. Nat. Mus. LXXXV, 1938, p. 70.

Phenacoscorpius megalops Herre, Philipp. Journ. Sci. 80, No. 4 (1951) 1952, p. 437.

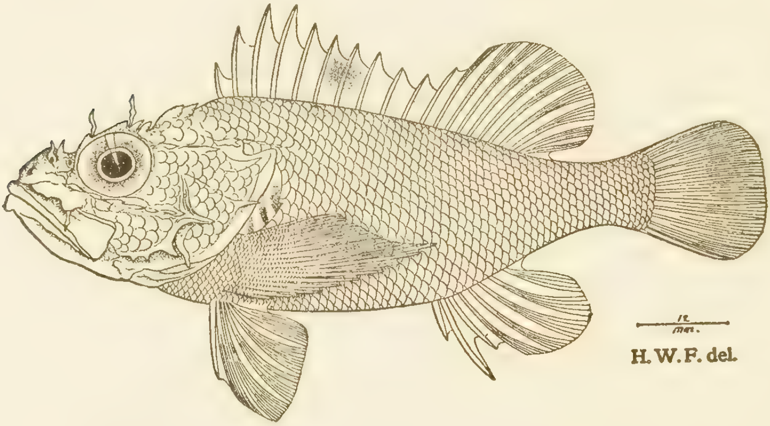

Fig. 1. *Phenacoscorpius megalops* Fowler. After Fowler.

D. XII. 9. A. III. 5. P. 1.8.8. V. I. 5. Sq. l. 30 + 3. Ltr. 14—15. Height 2.8—3. Head 2.2—2.3. Snout 4—4.2 in head. Eye 3.5—3.6, greater than snout or deeply concave interorbital space. Maxillary reaching to below middle of eye. Teeth finely villiform, in bands of moderate width in the jaws and small triangular band on vomer, none on palatines. Strong pair of nasal spines; pair of anterosupraorbitals, 3 pairs of posterosupraorbitals followed by 2 strong occipital and nuchal pairs; 3 postoculars, first small and close behind eye; strong suprascapular spine; 2 very broad obtuse preorbitals, suborbital stay with 6 or 7 spines, of which last may be double; 4 preopercular spines, with small one at outer front edge of uppermost, which longest; 2 widely divergent opercular spines, opposite and lower sometimes extends over gill opening; strong oblique humeral spine. Lateral line extends from suprascapula back on 4 or 5 scales, tubes large, well exposed and simple. Scales much smaller on breast, chest, and belly than on sides. More or less slender, simple, filaments at second supraorbital, occipital and second preorbital spines. Fourth dorsal spine $2^{7}/_{8}$—3 in head, fourth ray $2^{1}/_{6}$—$2^{1}/_{3}$. Second anal spine $2^{3}/_{5}$—$2^{2}/_{3}$, third ray $2^{1}/_{8}$—$2^{1}/_{5}$. Caudal $1^{4}/_{5}$—$1^{7}/_{8}$, rounded behind. Least depth of caudal peduncle $4^{1}/_{5}$—

$4^4/_5$. Pectorals $1^1/_3$—$1^2/_5$, ventrals $1^7/_8$—2 in head. Pale brownish. Fins all pale to whitish. Spinous dorsal with dark brown to blackish blotch on sixth or seventh (or even eighth) membranes. Length 109 mm (after Fowler, not seen by me).

Habitat: Between Halmahera and Kao, 230—265 fathoms. — Philippines, 37-340 fathoms.

2. **Parascorpaena** Bleeker

(Bleeker, Versl. Akad. Amsterdam (2) IX, 1876, p. 296)

Body covered with scales which are cycloid or ctenoid. Throat and entire underside scaled. Head scaleless with exception of some deciduous scales on upper part of preopercle and opercle. Ridges of head with well developed spines. A scaleless pit behind eyes. Villiform bands of teeth in jaws, on vomer, and on palatines. Dorsal originating above posterior part of opercle, with XII spines and 9-10 rays. Anal with III spines and 5 rays. Pectoral rays simple in young, in adults the upper rays are generally divided. Gill openings wide, gill membranes free from isthmus and from each other.

Distribution: Indo-West Pacific.

Note. This genus is close to *Scorpaena,* from which it differs by the scaled throat and breast.

Key to the Indo-Australian species of Parascorpaena

a. Upper rays of pectoral divided, at least in adults.
Scales cycloid . . . . 1. *P. picta* p. 7.
b. All pectoral rays simple. Scales ctenoid. . . . . 2. *P. bandanensis* p. 10.

1. **Parascorpaena picta** (C. V.) (Fig. 2, p. 8)

Scorpaena picta (K. & v. H.) Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 321.
Scorpaena polyprion Bleeker, Verh. Bat. Gen. XIII, 1850. Bijdr. kennis Scleroparei, p. 7. Bijdr. kennis ichthyol. fauna Bali, p. 5.
Scorpaena picta Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850, p. 1022.
Scorpaena picta Günther, Cat. Brit. Mus. II, 1860, p. 114.
Scorpaena polyprion Günther, l.c.
Scorpaena zanzibarensis Playfair, Fishes of Zanzibar, 1866, p. 47.
Scorpaena aplodactylus Day, Fishes of India, Part II, 1875, p. 149 (nec Blkr.).
Parascorpaena picta Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoïdes, p. 25. — Atl. Ichth. IX, 1879. Tab. CCCCXII, Fig. 5.
Scorpaena Bleekeri Day, Fishes of India, Part IV, 1878, p. 747.
Scorpaena picta M. Weber, Siboga Exp. Fische, 1913, p. 493.
Scorpaena bleekeri Giltay, Bull. Mus. Hist. Nat. Belg. IX, no. 14, 1933, p. 12.
Parascorpaena picta Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 403.

Parascorpaena picta Munro, The marine and fresh water fishes of Ceylon, 1955, p. 248.
Scorpaena picta Inger. Fieldiana, Zool. 36. no. 3. 1957. p. 375.

D. XII. 9—10. A. III. 5. P. I. 4. 11 or I. 5. 10 or I. 6. 10. V. I. 5. Ll. 34—40. Ltr. $\frac{6-8\,1)}{11-12}$.

Height 2.5—2.78, 3.1—3.5 in length with caudal. Head 2.3—2.6, 2.7—3.3 in length with caudal. Eye 3.3—4.5. Interorbital space very concave, 1.2—1.8 in eye. Snout 1—1.5 in eye. Mouth oblique. Maxillary reaching almost to below hindborder of eye or not quite so far. Villiform bands of teeth in the jaws, in a ʌ on head of vomer and in an elongate patch on palatines. Head naked, excepting a small patch of cycloid scales on upper part of preopercle and of opercle. Posterior nostril close before eye, anterior nostril with a flap. A blunt erect spine on the innerside of each anterior nostril, the peduncle of the premaxillaries fitting in between them. Supraorbital ridge with 3 spines, directed backwards. The parallel postorbital ridges with 3 spines, directed backwards, a deep depression between the anterior pair of spines. Two similar supraopercular spines. A strong preorbital spine directed forwards, a small spine at its base curved downwards and forwards. A minute spine directed upwards above it. Suborbital ridge with blunt spines in adults, scarcely developed in young ones, ending in a strong but slender preopercular spine. Three or four small spines below it on preopercular edge, the last one knob like. Two strong superior and one small inferior opercular

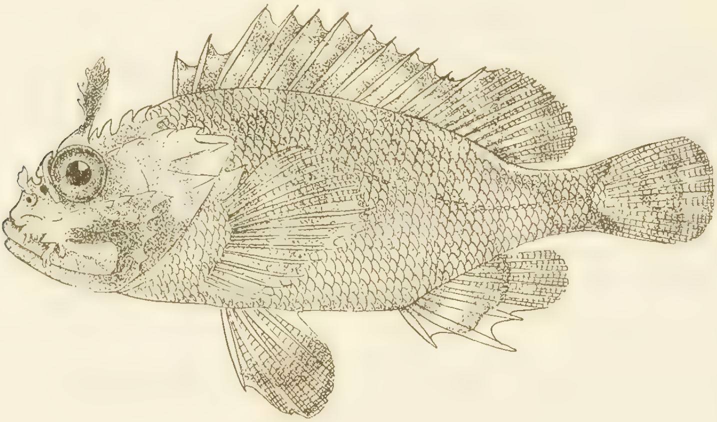

Fig. 2. *Parascorpaena picta* (C. V.). n. s.

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1) Counted between base of last dorsal spine and origin of anal.

spines. Short filaments along lower side of preorbital, preopercular and opercular edges, upper border of eye, and posteriorly on interorbital space. A large supraorbital denticulated tentacle, longer than eye, may be present. Body totally covered with cycloid scales, including the thoracal region anteriorly to isthmus. Four or five rows of scales before dorsal. A few cutaneous filaments at regular distances on lateral line, smaller ones on sides of body. Origin of dorsal above middle of upper border of opercle. First dorsal spine shorter than eye; spines increasing in length to the 4th or to the 5th and 6th which about equal eye and snout. Last dorsal spine longer than the penultimate one, about as long as or longer than snout. Membranes between the dorsal spines deeply incised. Soft dorsal rounded, the longest rays equal in length to 4th dorsal spine. Origin of anal below first dorsal ray. First anal spine about 2.5 in second, which is generally the longest and equal to postorbital part of head. Soft anal slightly rounded, the first ray as long as the second anal spine. Pectorals with a broad base, pointed, consisting of a weak spine, 4—6 branched rays and 10 or 11 thick simple rays, the longest median rays about as long as head without snout. Ventrals somewhat shorter than pectorals, their spine as long as the 4th dorsal spine. Caudal slightly rounded. Colour of preserved specimens brownish or yellowish, marbled with dark, in the form of irregular and indistinct broad transverse bands, down from base of spinous and from soft dorsal. Exceptionally a black blotch on nape. Fins light, mottled and banded with dark. An irregular oblique band on spinous dorsal, two more distinct ones on soft dorsal and anal. Caudal and pectorals with broad irregular transverse bars, which are less distinct on ventrals. Length 170 mm.

Nomen indig.: Lepu-karang (Benkulen).

Habitat: Singapore; Sumatra (Benkulen, Trussan, Ulakan, Priaman, Siboga, Tapanuli); Nias!; Batu Islands; Banka; Java (Jakarta, Karangbollong, Prigi); Bawean; Bali; Borneo (Pulo Bakkungaan Kachil, Pulo Nunuyan Laut); Savu!; Binongka!; Celebes (Macassar, Menado, Tanawanko); Biaru!; Talaut Islands!; Ternate; Ambon; Nusa Laut!; Tiur!; Kei Islands; Aru Islands!; Letti; Timor; New Guinea (Fr. Wilhelmshafen). — Seychelles, Zanzibar, Ceylon, Travancore, Andamans, Indochina, Pinang, Philippines, Fiji.

Note. M. Weber (l.c.) pointed out, that an orbital tentacle may be present in this species. Hence *bleekeri* and *zanzibarensis* can be considered as synonyms of *picta*. One of the two specimens described by Sauvage (Bull. Nouv. Arch. Mus. IX, 1873, p. 49) from "Indes orientales" as *Scorpaena armata* and which I examined in the Paris Museum differs from *picta* in having the third anal spine the longest, but in the other one the second one is the longest. It has been recorded by Pillay (Journ. Bombay Nat. Hist. Soc. XXXIII, No. 2, 1929, p. 375) from Cape Comorin, and from Southport, Queensland, by Borodin (Vanderbilt Marine Mus. I, Art. 3, 1932, p. 89). Sauvage (Poissons de Madagascar, 1891, p. 291) describes *picta* from the Seychelles as having the second and third anal spines of equal length, hence intermediate between *picta* as described here and *armata*. I find the difference in length between the second and third anal spines of *picta* very variable, although the second is generally the longer.

2. **Parascorpaena bandanensis** (Blkr)

Scorpaena bandanensis Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, 237.
Scorpaena aplodactylos Bleeker, ibid. III, 1852, p. 698.
Scorpaena haplodactylus Günther, Cat. Brit. Mus. II, 1860, p. 117.
Scorpaena bandanensis Kner, Novara Exp. Fische I, 1865-1867, p. 116.
Scorpaena haplodactyla Steindachner, Sitzber. Akad. Wiss. Wien LVI, 1867, p. 311.
Parascorpaena bandanensis Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876, Mém. Scorpénoides, p. 26 — Atl. Ichthyol. IX. Tab. CCCCIV, Fig. 4.
Scorpaena bandanensis Steindachner, Abh. Senckenberg. naturf. Ges. XXV, Heft 11, 1901, p. 423.
Merinthe bandanensis Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 374.
Scorpaena bandanensis M. Weber, Siboga Exp. Fische, 1913, p. 495.
Scorpaena bandanensis Fowler, Monogr. Acad. Nat. Sci. Philadelphia II, 1938, p. 202.
?*Scorpaena mcadamsi* Fowler, Proc. U. S. Nat. Mus. LXXXV, 1938, p. 60.
Parascorpaena bandanensis Herre, Philipp. Journ. Sci. 80, 1952, p. 402.

D. XII. 9 (10). A. III. 5. P. 15. V. I. 5. Sq. lat. 34. Ltr. $\begin{array}{c}5\text{-}6\\ \hline 1\\ \hline 10\text{-}11\end{array}$.

Height 2.4—2.6, 3.2 in length with caudal. Head 2.2—2.4, 3 in length with caudal. Eye 3.4—3.8. Interorbital space a deep groove between two suborbital ridges, 1.6—2 in eye. Eye 1—1.2 in snout. Mouth somewhat oblique. Maxillary reaching to below hindborder of pupil. Villiform teeth in the jaws, in a Λ on head of vomer, and in narrow bands on palatines. Head naked, with exception of deciduous scales on upper part of opercle. Anterior and posterior nostrils close before eye, each with a short flap. A short, blunt, erect spine on the inner side of each anterior nostril, the peduncle of the premaxillaries fitting in between them. Supraorbital ridge with three recumbent spines. Two similar spines on each postorbital ridge, the ridges slightly diverging posteriorly, and with a moderately deep depression between them. Two similar supraocular spines and sometimes two small ones between these and the postorbital spines. A short and blunt preorbital spine, directed forwards and a much stronger one directed downwards and somewhat backwards. Suborbital ridge without distinct spines, ending in a preopercular spine. Three small spines below the preopercular spine along the preopercular edge. Two radiating ridges on opercle, each ending in a spine on opercular edge. Short filaments on many of the spines on head. Supraorbital tentacles denticulated, as long as eye. Body totally covered with ctenoid scales. Three or four rows of scales before dorsal. Origin of dorsal above middle of upper border of opercle. First dorsal spine somewhat less than eye, spines increasing in length to the fifth, which is slightly shorter than eye and snout. Last dorsal spine longer than the penultimate one, and as long as snout. Membranes between the spines incised. Soft dorsal rounded, the longest ray equal in length to the longest dorsal spines. Origin of anal below last dorsal spine or first dorsal ray. First anal spine less than half length of second, which is slightly longer than third and equal to postorbital part of head. Pectorals pointed, all rays simple, the longest almost as long as head, ventrals somewhat shorter. Caudal slightly rounded. Colour of preserved specimens yellowish brown, marbled with dark brown, nape often with a dark blotch; lower jaw sometimes distinctly streaked white and brown. Fins marbled or indistinctly banded with brown. Length 76 mm.

Habitat Singapore; Java (Patjitan); Bawean; Paternoster Islands!; Pulu Barang!; Kabala dua!; Maratua Island; Celebes (Badjoa, Menado, Tanawanko, Tombariri); Kabaëna!; Sangir Islands!; Talaut Islands!; Nenusa Islands; Sulu Islands!; Sula Islands!; Buru; Ceram!; Ambon; Haruku; Nusa laut!; Samau!; Lamakera!; Flores; Rotti!; Siau!; Tiur!; Banda!; Goram; Timor; Tenimber Islands; Halmahera; Morotai; Ternate!; Waigeu; Kei Islands; Aru Islands; New Guinea (Manokwari). — Ceylon, Christmas Island, Philippines, Cocos Keeling Islands, Cape York, New Hebrides, Marianas, Samoa.

Note. This species is very close to *picta,* the chief difference being the ctenoid scales and the lack of branched rays in the pectorals. In the young of *picta,* however, the scales are slightly ctenoid and all pectoral rays are simple. It is therefore difficult to distinguish between young specimens of the two species. Bleeker gives as additional differences the number of scales above the lateral line, which according to him is 45 in *picta* and 36 in *bandanensis,* and the position of the posterior preorbital spine, which is directed forwards in *picta* and backwards in *bandanensis*. I do not find the differences in scale count but the posterior preorbital spine, which is directed downwards in both species, has a forward trend in *picta* and a backward trend in *bandanensis*.

Bleeker (l.c. 1876) pointed out that the fish described by Day (Fishes of India, Part I, 1875, p. 149) as *Scorpaena haplodactylus* is not Bleeker's species of that name, as it has another scale count and five branched rays in the pectorals. This has been overlooked by recent South African authors, who mention *S. haplodactylus* Blkr from the east coast of S. Africa, but based on the description of Day's species.

According to the description *Kantapus oglinus* J. L. B. Smith (Ann. Mag. Nat. Hist. (11) XIII, 1947, p. 79. , and The Sea Fishes of S. Africa, 2nd ed. 1950, p. 369) from the east coast of S. Africa is close to *bandanensis*.

3. **Scorpaenopsis** Heckel

(Heckel, Ann. Wiener Mus. II, 1837, p. 158)

Body covered with scales, which are ctenoid on sides, at least anteriorly, and cycloid on lower side. Throat scaled. Head scaleless, with exception of opercle and preopercle. Ridges of head with well developed spines. A deep depression before eye. A scaleless quadrangular pit behind eyes more or less developed. Villiform bands of teeth on jaws and vomer, palatines toothless. Dorsal originating above posterior part of opercle, with XII spines and 9-10 rays.

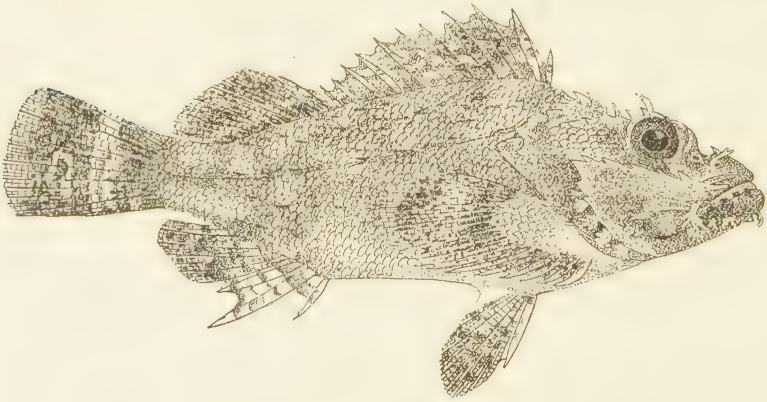

Fig. 3. *Scorpaenopsis novae-guineae* (C. V.). × $^5/_6$.

Anal with III spines and 5 (6) rays. Upper pectoral rays divided, lower rays simple. Gill openings wide. Gill membranes free from isthmus and from each other.

Distribution: Indic and Pacific.

Key to the Indo-Australian species of Scorpaenopsis

I. Back not gibbous. Height 2.8—3.4.

A. L. tr. $\begin{array}{c}7-9\\ \hline 1\\ \hline 11-15\end{array}$. Sq. l. 37—58.

1. Two parallel ridges on interorbital space, sharply converging behind eye, where they are almost or totally united.

a. Sq. l. 54—58. L. tr. $\begin{array}{c}9\\ \hline 1\\ \hline 15\end{array}$. Eye 2—3 in snout 1. *S. oxycephalus* p. 13.

b. Sq. l. 38—52. L. tr. $\begin{array}{c}7-8\\ \hline 1\\ \hline 12-13\end{array}$. Eye 1.5—2 in snout . . . . 2. *S. cirrhosa* p. 15.

2. Two parallel ridges on interorbital space, sharply diverging at almost right angles behind eye and more or less ending into a spine. L. tr. $\begin{array}{c}7\\ \hline 1\\ \hline 11-13\end{array}$. Eye 1.4—1.5 in snout . . . . 3. *S. novae-guineae* p. 17.

B. Ltr. $\begin{array}{c}5\\ \hline 1\\ \hline 11\end{array}$. Sq. l. 27 . . . . 4. *S. cotticeps* p. 19.

II. Back gibbous. Height 2.3—2.9. Pit behind eye very deep.

1. L. tr. $\begin{array}{c}5\\ \hline 1\\ \hline 9\end{array}$. Interorbital with well marked parallel ridges . . . . 5. *S. simulata* p. 19.

2. L. tr. $\begin{array}{c}7\\ \hline 1\\ \hline 13-14\end{array}$. No distinct ridges on interorbital space . . . . 6. *S. gibbosa* p. 21.

1. **Scorpaenopsis oxycephalus** (Blkr)

Scorpaena oxycephalus Bleeker, Verh. Bat. Gen. XXII, 1849. Bijdr. kennis Scleroparei, p. 7.

Scorpaena oxycephalus Kner, Novara Exp. Fische I, 1865—1867, p. 116.
Scorpaenopsis oxycephala Sauvage, Bull. Nouv. Arch. Mus. IX, 1873, p. 52.
?*Scorpaenopsis cirrhosa* Day, Fishes of India, Part I, 1875, p. 150 (nec Thunb. ?).
Scorpaenopsis oxycephalus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876, Mém. Scorpénoides, p. 30. — Atl. Ichth. IX, 1879, Tab. CCCCXIV, Fig. 2.
Scorpaenopsis cirrhosa Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 413 (nec Thunb.).

D. XII. 9—10. A. III. 5. P. 1. 5. 13 or 1. 6. 12. V. I. 5. Sq. l. 54—58. Ltr. $\begin{array}{c} 9 \\ \hline 1 \\ 15 \end{array}$.

Height 3.2—3.3, 3.9—4.1 in length with caudal. Head 2.5, 3.1 in length with caudal. Eye 5.3—6, 2—3 in snout, and slightly more than very concave interorbital space. Mouth oblique. Maxillary reaching to below hindborder of eye, posteriorly as deep as eye. Villiform bands of teeth in jaws and on vomer, none on palatines. Head naked, with exception of preopercle and opercle. A depression before eyes, in which the posterior nostrils are situated. A short but sharp spine in front of them, medial of the anterior nostrils, which have a long flap. A smooth median ridge from between posterior nostrils to anterior part of interorbital space, flanked by two parallel smooth ridges, diverging slightly posteriorly and then converging again and connected behind eye by a convex ridge, the convexity of which is directed towards the shallow occipital pit behind it. Supraorbital ridge with 3 spines, directed backwards. No orbital tentacles. Superior and inferior postorbital ridges each with 3 spines. Suborbital ridge with 5 spines, directed backwards, excepting the first, which is erect and small, the 4th and 5th close together on preopercular edge; two small spines below them. A moderately deep depression anteriorly and below eye. Two opercular ridges ending in spines. Cutaneous filaments or tentacles along chin and lower jaw, along preopercular edge, none or a few only along lateral line. Ten to eleven scales between head and origin of dorsal. Scales ctenoid, excepting those of thoracal region and belly, which are cycloid and much smaller. Origin of dorsal above second half of opercle. First dorsal spine less than half length of second, third and fourth spines longest, somewhat longer than snout, 11th spine equal in length to first, 12th spine as long as 9th. Soft dorsal rounded, the longest ray as long as longest dorsal spine. First anal spine half length of second, which is longest and strongest and about as long as snout. Soft anal somewhat rounded, the longest ray as long as eye and snout. Pectorals as long as head without snout. Upper pectoral rays branched, the others simple. Ventrals as long as pectorals; ventral spine as long as 7th dorsal spine. Caudal slightly rounded. Colour of preserved specimens yellowish brown. Fins with a network of white, encircling gray blotches bordered with dark brown ,most distinct on caudal in a large specimen. Length almost 300 mm. (Description made after specimens of Bleeker's collection in the Leiden Museum).

Nomen indig.: Krapo setan (Malay.).

Habitat: Sumatra (Padang, Priaman); Biliton; Java (Jacarta, Prigi); Bawean; Bali; Celebes (Macassar, Badjoa); Ceram; Ambon; New Guinea (Manokwari). — Coasts of India?, Tonkin, China, Paracel Islands, Philippines. In sea.

2. **Scorpaenopsis cirrhosa** (Thunb.)

Perca cirrhosa Thunberg, Nya Handl. Ac. Stockholm XIV, 1793, p. 193.
Scorpaena cirrhosa Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 318.
Scorpaena papuensis Cuvier & Valenciennes, ibid. p. 321.
Scorpaena cirrhosa Schlegel, Fauna Japonica, Pisces I, 1842, p. 42.
Scorpaena cirrhosa Bleeker, Verh. Bat. Gen. XXVI, 1854-1857. Nieuwe Nalez. ichth. Japan, p. 79.
Scorpaena cirrhosa Günther, Cat. Brit. Mus. II, 1860, p. 120 (sine syn.).
Scorpaena cirrhosa Klunzinger, Verh. zool. bot. Ges. Wien XX, 1870, p. 801.
Scorpaena cirrhosa Günther, Fische der Südsee I, 1873-1875, p. 78 (sine syn.).
Scorpaenopsis cirrhosa Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 32. — Atl. Ichth. IX, 1879, Tab. CCCCXIII, Fig. 6.
Scorpaenopsis papuensis Sauvage, Nouv. Arch. Mus. Hist. Nat. (2) I, 1878, p. 129.
Scorpaena (Scorpaenopsis) cirrhosa Klunzinger, Fische des rothen Meeres I, 1884, p. 70.
Scorpaena cirrhosa Sauvage, Poissons de Madagascar, 1891, p. 299.
Scorpaenopsis cirrhosa Jordan & Starks, Proc. U. S. Nat. Mus. XXVII, 1903, p. 136.
Scorpaenopsis cirrhosa Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 38.
Scorpaena cirrhosa Snyder, Proc. U. S. Nat. Mus. XLII, 1912, p. 428.
Scorpaenopsis cirrosa Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 905.
Scorpaenopsis cirrhosus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 285. — Hongkong Nat. 6. suppl. 1938, p. 35.
Scorpaenopsis cirrhosa Matsubara, Trans. Sigenkagaku Kenkyusyo 2, 1943, p. 319.
Scorpaenopsis cirrhosa Boeseman, Rev. coll. Burger and v. Siebold, Japan, 1947, p. 52.
Scorpaenopsis cirrhosus Fowler, Mem. B. P. Bishop Mus. XII. 2, 1949, p. 106.
Scorpaenopsis cirrhosa J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950, p. 371.

Scorpaenopsis cirrhosus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 247.

D. XII. 9—10. A. III. 5 (6). P. I. 5. 11 or I. 5. 12 or I. 6. 10. V. I. 5. Sq. l. 38—52. L.tr. $\begin{array}{c}7\text{-}8\\ 1\\ \hline 12\text{-}13\end{array}$.

Height 2.9—3.4, 3.7—4.26 in length with caudal. Head 2.36—2.5, 2.98—3 in length with caudal. Eye 4.5—6, 1.6—2 in snout. Interorbital space very concave, 1.3—1.6 in eye. Mouth oblique. Maxillary reaching almost to below hindborder of eye, posteriorly as deep as eye. Villiform bands of teeth in the jaws and in a narrow band on head of vomer, none on palatines. Head naked, excepting opercle and preopercle. Anterior profile of head with a deep notch before eyes, in which the posterior nostrils are situated. A short spine in front of them and at the inner side of the anterior nostril, which has a long flap. A low, smooth, longitudinal, median ridge, starting from between posterior nostrils and ending in interorbital space, flanked by two longitudinal, low, and smooth ridges, running parallel along the innerside of the supraorbital ridges, curved inward behind eye and almost meeting each other. Supraorbital ridges each with 3 spines, directed backwards. A distinct quadrangular pit behind interorbital space, bordered behind by a transverse ridge separating it from the scaled occiput and on the sides by the superior postorbital ridges which form a continuation of the supraorbital ridges. Superior and inferior postorbital ridges each with 3 spines. A short spine between the superior and inferior postorbital ridges, posterior to the last spine of the superior and anterior to the last spine of the inferior postorbital ridges. A deep longitudinal groove below and somewhat before eye, bordered below by the suborbital ridge, which has five spines, the last one on the hindborder of the preopercle, with a few spines below it. Opercle with three spines, the median one at the end of a low ridge. A short blunt spine on shoulder girdle. Body covered with ctenoid scales on sides, those of thoracal region and belly smaller and cycloid; 49 transverse rows of scales between head and base of caudal. About 8-10 rows of scales between head and origin of dorsal. Cutaneous flaps, which often are branched or arborescent on jaws and lips, on some of the spines, and scattered on scales of the body, especially on those of the lateral line. A long, lanceolate tentacle above each eye. Origin of dorsal above second half of opercle. First dorsal spine half as long as second, which is shorter than third and fourth. Third and fourth spines longest, slightly shorter than postorbital part of head. Spines decreasing in length to the eleventh, which is as long as first; the twelfth spine is as long as the second. Soft dorsal rounded, the longest rays as long as the longest dorsal spines. The first anal spine is very short, the second longest and strongest, longer than dorsal spines; anal rays also longer than dorsal rays. Pectorals with a weak spine, half as long as longest pectoral rays, which almost equal head without snout. The upper pectoral rays are branched, the lower simple. Ventrals slightly longer than postorbital part of head. Caudal slightly rounded. Colour of preserved specimens brownish, marmorated with dark. Fins also variegated with darker; dark, irregular cross bands on anal, pectorals, and caudal. Length 500 mm. (Type of *S. papuensis* in the Paris Museum, examined. Specimens of Bleeker's collections in the Leiden and Amsterdam Museums examined).

Habitat: Singapore; Ternate!; Buru; Adonare!; Ambon; New Guinea! — East coast of Africa, Madagascar, Red Sea, Persian Gulf, Arabian Sea, coasts of India, Ceylon, China, Korea, Japan, Riu Kiu Islands, Philippines, Tahiti, Society Islands. In sea.

3. **Scorpaenopsis novae-guineae** (C. V.) (Fig. 3, p. 12).

?*Scorpaena rawakensis* Quoy & Gaimard, Voyage Uranie et Physicienne, Zool. 1824, p. 325.
Sorpaena Novae-Guineae Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 320.
Scorpaenopsis Novae-Guineae Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénides, p. 34. Alt. Ichth. IX, 1879, Tab. CCCCXVII, Fig. 6.
Scorpaenopsis Novae-Guineae Sauvage, Nouv. Arch. Mus. Nat. Hist. (2) I, 1878, p. 129.
Sebastopsis novae-guineae Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 375 (errore).
Scorpaenopsis novae-guineae Jordan & Seale, l.c. — ibid. XXVI (1906) 1907, p. 38.
Scorpaenopsis novae-guineae Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 286.
Scorpaenopsis novae-guineae Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 415.
Scorpaenopsis novae-guineae Munro, The marine and fresh water fishes of Ceylon, 1955, p. 247.

D. XII. 9—10. A. III. 5 (6). P. 1.3—5 + 11—13. V. I. 5. Sq. l. 37—42. L. tr. $\dfrac{7}{\dfrac{1}{11\text{-}13}}$.

Height 2.8—3.3, 3.4—3.9 in length with caudal. Head 2.2—2.4, 2.7—3 in length with caudal. Eye 4.1—11.5, according to size of specimen. Interorbital space very concave, 1.04—1.3 in eye. Eye 1.4—1.5 in snout. Mouth oblique. Maxillary reaching to below posterior border of pupil, posteriorly about as deep as eye. Villiform bands of teeth in the jaws, and in a narrow band on head of vomer, none on palatines. Head naked, excepting opercle and preopercle. A deep depression before eyes, wherein the posterior nostrils are situated. A short spine in front of them and at the innerside of the anterior nostrils, which have a long flap. A low, smooth, longitudinal median ridge, starting from between posterior nostrils and ending in interorbital space, flanked by two longitudinal, low, and smooth ridges, which run parallel and along the innerside of the supraorbital ridges, curved inwards below eye. Supraorbital ridge with three spines. A shallow pit behind interorbital space, not distinctly separated by a bony transverse ridge from the scaled occiput, bordered at the sides by the superior postorbital ridges, which form a continuation of the supraorbital ridges. They bear three spines each. Inferior postorbital ridge beginning with a few short, erect, crowded spines, and bearing three spines, directed backwards, the last above posterior part of opercle. A short spine between the superior and inferior postorbital ridges, posterior to the last spine of the superior, and anterior to the last spine of the inferior postorbital ridges. A depression below the eye, bordered below by the suborbital ridge, which has five spines, the last one on the hind-border of the preopercle, with a few spines below it. Opercle with three flat spines, the lowest of which is poorly developed. Body covered with ctenoid scales on sides, those of thoracal region and belly smaller and cycloid. Seven to ten scales before dorsal, 44-48 rows of scales between head and base of caudal. Cutaneous flaps, often branched and arborescent on jaws and lips, on some of the spines, and on scales, especially on those of the lateral line. Supraorbital ridge with a moderate flap or tentacle. Origin of dorsal above second half of opercle. First dorsal spine half as long as second, which is shorter than third. Fourth spine longest, shorter than postorbital part of head. Spines decreasing in length posteriorly, the eleventh slightly longer than the first. The last dorsal spine equal to or somewhat shorter or longer than the second spine. Soft dorsal rounded, the longest rays longer than the longest dorsal spines. First anal spine slightly less than half length of second spine, which is longer than third and almost as long as postorbital part of head. Pectorals with a weak spine, slightly less than head without snout. The upper pectoral rays are branched, the lower ones simple. Ventrals slightly longer than postorbital part of head. Caudal slightly rounded. Colour of preserved specimens reddish brown, lighter below, irregularly banded transversally with dark. Fins with dark bars, consisting of rows of blotches and less irregular on caudal and anal than on other fins. Length 195 mm. (Type of species examined in Paris Museum).

Habitat: Nias!; Sumatra (Priaman) Borneo (Sandakan); Celebes (Makassar); Ceram; Ambon; Waigeu?; Rawak?; New Guinea (Sorong). — Ceylon, Siam, Philippines, Samoa, Fiji. In sea.

Note. After having examined the type of *S. novae-guineae* in the Paris Museum I am convinced that the specimens described by Bleeker really belong to this species and not to *papuensis*, as was Sauvage's opinion. I see no difference between lastnamed species and *cirrhosa*.

4. **Scorpaenopsis cotticeps** Fowler.

Scorpaenopsis cotticeps Fowler, Proc. U. S. Nat. Mus. LXXXV, 1938, p. 65.
Scorpaenopsis cotticeps Herre, Philipp. Journ. Sci. 80, 1952, p. 412.

D. XII. 10. A. III. 5. P. 14. V. I. 5. Ll. 27. L.tr. $\begin{array}{c}5\\ \hline 1\\ \hline 11\end{array}$.

Height 2.4. Head 2. Snout 3 in head. Eye $3^7/_8$, greater than interorbital space. Maxillary reaching to below last quarter of eye. Villiform teeth in jaws and on vomer, none on palatines. Opercle with few small scales. Small scales on breast, chest, and prepectoral region. Six scales before dorsal. Fourth dorsal spine $2^3/_4$ in head. Second anal spine 3 in head. All pectoral rays simple. Caudal rounded. Length of single specimen known 38 mm. (After Fowler, not seen by me).

Habitat: Tinakla Island, Sulu Archipelago.

Note. The fact that all pectoral rays are simple may be caused by the youth of the single specimen known.

5. **Scorpaenopsis simulata** n. sp.

Scorpaena rosea M. Weber, Siboga Exp. Fische, 1913, p. 496 (nec Day).

D. XII. 9 (10). A. III. 5. P. 1. 4. 12. V. I. 5. Ll. 35. L.tr. $\begin{array}{c}5\\1\\9\end{array}$.

Profile of back elevated behind eye. Height 2.3, 2.9 in length with caudal. Head 2.1, 2.6 in length with caudal. Eye 4.2, 1.25 in snout. Interorbital space three fourths of eye, concave, with two indistinct longitudinal ridges. Mouth oblique. Maxillary reaching to below posterior border of eye, its depth posteriorly less than eye. Pointed teeth in several rows in the jaws, in a few rows on vomer. Palatines edentulous. A deep depression before eyes wherein the posterior nostrils are placed. A blunt spine between the anterior and posterior nostrils, the anterior one with a fringed flap. Two spines on supraorbital ridge, the anterior one with a fringed tentacle. The interorbital ridges diverge backwards and end in a spine, they are connected by a transverse, somewhat curved ridge, which bears a spine in its middle, directed backwards. This ridge forms the anterior boundary of a deep quadrangular occipital depression, bordered at the sides by the superior postorbital ridges, which have two spines. Inferior postorbital ridges with three spines. A spine between the last spines of superior and inferior postorbital ridges. Preorbital with a spine, obliquely directed backwards and downwards. A deep depression below eye, bordered below by the suborbital ridge, which has 4 spines, the last one on hindborder of preopercle and the uppermost of a series of 4 spines along the preopercular edge. Operculum with two divergent ridges, the upper one ending in two spines, the lower one in one spine. First dorsal spine more than half length of second. Fifth and sixth spines slightly longer than third and fourth, equal to snout. Spines decreasing in length posteriorly, the eleventh between the first and second in length, the last about as long as the third. Soft dorsal truncate, the longest rays as long as longest dorsal spines. First anal spine more than half length of second, which is stronger but not longer than third and as long as third dorsal spine. Soft anal slightly rounded, the longest rays longer than those of dorsal. Pectorals shorter than head, ventrals as long as postorbital part of head and half eye. Caudal rounded. Scales ctenoid, those of lower side almost cycloid. A few scales on upper part of opercle, rest of head naked. Fleshy tentacles scattered on head, especially on the spines, and on scales. Colour of preserved specimen pinkish with gray marmorations. Round black blotches on the median pectoral rays. Other fins hyaline, traces of reddish bands on anal. Length of specimen described 45 mm.

Habitat: Sulu Islands!

Note. The specimen recorded by M. Weber l.c. as *Scorpaena rosea* Day is not that species. I examined a typical specimen of *S. rosea* in the British Museum and found that it is more elongate (height 2.9) and that it has smaller scales (Ll. about 46, Ltr. 8/1/13), besides there are differences of minor importance. I cannot refer the small specimen from the Siboga Expedition to any known species of *Scorpaenopsis* and hence had to give it a new name. It may be near *Scorpaenopsis macrochir* Ogilby (Proc. Royal Soc.

Queensland XXIII, 1910, p. 29) but that species has a much broader interorbital space. According to M. Weber it was dredged from a bank of Lithothamnion, to which algae it resembled in colour pattern.

6. **Scorpaenopsis gibbosa** (Bl. Schn.)

Scorpaena gibbosa Bloch, Schneider, Syst. Ichthol. 1801, p. 192.
Scorpaena diabolus Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 312.
Scorpaena nesogallica Cuvier & Valenciennes, ibid. p. 315 (partim?).
Scorpaena diabolus Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 266.
Scorpaena gibbosa Bleeker, Acta Soc. Indo-Neerl. I. 1856. Beschr. vischsoorten Amboina, p. 31.
Scorpaena gibbosa Klunzinger, Verh. zool. bot. Ges. Wien XX, 1870, p. 800.
Scorpaenopsis gibbosa Sauvage, Bull. Nouv. Arch. Mus. Nat. Hist. IX, 1873, p. 50.
Scorpaena gibbosa Günther, Fische der Südsee I, 1873-1875, p. 79.
Scorpaenopsis diabolus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénides, p. 36. Atl. Ichth. IX, 1879, Tab. CCCCXI, Fig. 5, Fig. 5a.
Scorpaenopsis gibbosus Bleeker, ibid. p. 38. — Atl. ibid. Tab. CCCCXVI, Fig. 4.
Scorpaena diabolus Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 133.
Scorpaena (*Scorpaenopsis*) *gibbosa* Klunzinger, Fische des rothen Meeres I, 1884, p. 70.
Scorpaenopsis gibbosa Sauvage, Poissons de Madagascar, 1891, p. 297.
Sorpaenopsis gibbosa Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 468.
Scorpaenopsis gibbosa Jordan & Seale, ibid. XXV (1905) 1906, p. 375.
Scorpaena gibbosa M. Weber, Siboga Exp. Fische, 1913, p. 494.
Scorpaenopsis gibbosa Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 906.
Scorpaenopsis gibbosa Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 286. — ibid. XI. No. 5, 1931, p. 348.
Scorpaenopsis gibbosa Pietschmann, Bull. B. P. Bishop Mus. 73, 1930, p. 17.
Scorpaenopsis gibbosus Fowler, Monogr. Acad. Nat. Sci. Philadelphia II, 1938, p. 129, p. 148, p. 173.
Scorpaenopsis gibbosa Matsubara, Trans. Sigenkagaku Kenkyusyo 2, 1943, p. 322.
Scorpaenopsis gibbosa J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950, p. 371.
Scorpaenopsis gibbosa Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 417.
Scorpaenopsis gibbosa Randall, Atoll Res. Bull. 47, 1955, p. 201.
Scorpaenopsis gibbosus Inger. Fieldiana, zool. 36. No. 3, 1957, p. 376.

D. XII. 9—10. A. III. 5. P. 1. 5. 11 or 1. 6. 11. V. I. 5. Ll. 35—37. Ltr. $\begin{array}{c}7\\ \hline 1\\ \hline 13\end{array}$.

Back elevated behind head. Height 2.5—2.9, 3—3.4 in length with caudal. Head 2.1—2.3, 2.6—2.9 in length with caudal. Eye 5.4—7.2, 1.3—1.7 in concave interorbital space and 1.6—2.3 in snout. Mouth oblique. Maxillary reaching below posterior border of eye or nearly so, posteriorly deeper than eye. Villiform bands of long, pointed teeth in the jaws, shorter teeth in a few rows on vomer, none on palatines. Head naked, excepting upper parts of opercle and preopercle. Head with a depression before eyes, in which the posterior nostrils are situated. A clutch of short spines before them and at the innerside of the anterior nostrils, which have an indentated flap. Interorbital space without well marked longitudinal ridges. Supraorbital ridge with strong spines, posteriorly shorter and crowded. Here the ridge forks into a superior and an inferior postorbital ridge. The superior postorbital ridge borders a quadrangular rather deep median postorbital depression, and bears three spines. The inferior postorbital ridge also has three spines, the last above posterior part of opercle. A spine between the two ridges, behind the last spine of the superior and before that of the inferior ridge. Spines diverge forwards, downwards, and backwards from the centre of the preorbital. A longitudinal groove below eye, deepening into a pit anteriorly, bordered below by the suborbital ridge which has five spines, the last one on hindborder of preopercle. A few spines below it on preopercular edge. Opercle with two flat spines and an indication of a third, lower one. Anterior sides of body covered with feebly ctenoid scales, those of the posterior part of sides and of underside almost or totally cycloid. About 8 rows of scales before dorsal, about 42—46 scales from head to caudal. Shorter or longer cutaneous flaps, generally edentated, on some of the spines, on scales, specially on those of the lateral line, and on different parts of the body and head, even short ones on the pectoral fins. Origin of dorsal above middle of opercle. Dorsal spines short but strong, the first more than half length of second. Third and fourth spines longest, or fourth slightly shorter, equal to snout. Spines decreasing in length to the eleventh, which stands in length between the first and the second; last spine almost as long as third one. Soft dorsal rounded, its longest rays much longer than longest dorsal spines. First anal spine half as long as second or slightly shorter. Second anal spine somewhat longer than third and equal to snout or somewhat longer. Soft anal rounded, the longest rays longer than those of soft dorsal. Pectorals longer than ventrals which are as long as postorbital part of head. Caudal slightly rounded, almost truncate. Colour of preserved specimens reddish or brownish. In young specimens often a broad dark brown or blackish band, running from median dorsal spines obliquely downwards to pectorals; another less distinct band on soft dorsal to base of anal, which has a broad, black, transverse band. A third band on end of caudal peduncle and base of caudal. Rests of these bands as blotches or clouded marmorations often visible in larger specimens. Axil of pectorals always with black spots or marmorations. Caudal generally with a double, transverse, dark band. Pectorals either with a dark subterminal band or with a row of dark spots on the upper part of the fin, both bands and spots more distinct on the innerside than on the outerside of the fin. Length 240 mm.

Habitat: Singapore; Sumatra (Trussan, Siboga); Nias!; Java (Patjitan); Bawean; Celebes (Badjoa); Saleyer!; Talaut Islands!; Batjan; Buru!; Ceram; Ambon!; Nusa laut!; Banda; Timor; Taam!; Aru Islands; Waigeu!; New Guinea (Manokwari, Humboldt Bay!, Port Moreby). — Coast of Natal, Madagascar, Mauritius, Réunion, Seychelles, Zanzibar, Red Sea, Cochinchina, Pulu Condor, China, Quelpart Island near Korea, Japan, Riu Kiu Islands, Formosa, Philippines, Pelew Islands, North Australia, Banks Islands, Gilbert Islands, Fiji, Rotuma, Samoa, Society Islands, Tuamotu Islands, Marquesas Islands, Hawaii. In sea.

Note. Most authors have united *S. gibbosa* and *S. diabolus,* but Bleeker kept them apart. The only difference between the two is that in *S. gibbosa* the innerside of the pectoral has a continuous subterminal black band, whereas in *S. diabolus* the band is absent in the lower part of the fin and broken into spots in the upper part. The differences in the number of scales, mentioned by Bleeker, have not been confirmed by other authors, and I can but agree with them. M. Weber suggested the possibility of *S. gibbosa* being the female, *S. diabolus* the male, as two specimens of *S. diabolus* examined by him were males and one specimen of *S. gibbosa* a female, but among my material is a female which shows the marks of *S. diabolus* in the pectoral. These characteristics hence are not linked to sex.

4. **Sebastapistes** Streets.

(Streets, Bull. U. S. Nat. Mus. VII, 1878, p. 62)

Body covered with mostly ctenoid scales. Throat and rest of lower side scaled. Sides of head scaly. Snout and interorbital space scaleless, postorbital part of head scaled or naked above. Ridges of head with moderately developed spines. No postocular pit. Villiform teeth in jaws, on vomer, and on palatines. Dorsal originating above posterior part of opercle, with XII spines and 9—12 rays. Anal with III spines and 5 rays. Upper pectoral rays divided, lower rays simple or all rays simple. Gill membranes free from isthmus and from each other.

Distribution: Indo-Pacific.

Key to the Indo-Australian species of Sebastapistes

A. Ll. 46—50. Upper postorbital part of head without scales.
  a. Suborbital ridge without spines. Body generally covered with white spots. P. 1. 5. 10. . . . . 1. *S. strongia* p. 25.
  b. Suborbital ridge with four spines. A large black spot on base of dorsal between 7th and 10th spines. P. 16, all rays simple . . . . 2. *S. rhodochrous* p. 26.
B. Ll. 36—38. Postorbital part of head scaly. Interorbital ridges not connected by a transverse ridge posteriorly. P. 1.8—9.10 . 3. *S. amplisquamiceps* p. 27.
C. Ll. 38. Postorbital part of head without scales. Interorbital ridges converging posteriorly and connected with each other . . 4. *S. bynoensis* p. 28.

1. **Sebastapistes strongia** (C. V.) (Fig. 4, p. 25)

Scorpaena strongia Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 323.
Scorpaena strongia Quoy & Gaimard, Voyage Astrolabe, Zool. 1834, p. 688. Pl. 11. Fig. 2.
Scorpaena cyanostigma Bleeker, Nat. Tijdschr. Ned. Indië XI, 1856, p. 400.
Sebastes strongensis Günther, Cat. Brit. Mus. II, 1860, p. 105.
Sebastes strongia Klunzinger, Verh. Zool. Bot. Ges. Wien XX, 1870, p. 803.
Scorpaena strongia Günther, Fische der Südsee I, 1873—1875, p. 80.
Sebastichthys cyanostigma Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénides, p. 17. Atl. Ichth. IX, 1879. Tab. CCCCXVI. Fig. 1.
Sebastes strongia Klunzinger, Fische des rothen Meeres I, 1884, p. 71.
Sebastapistes strongia Fowler, Proc. Acad. Nat. Sci. Philadelphia 1900, p. 515.
Sebastes strongia M. Weber, Siboga Exp. Fische, 1913, p. 490.
Sebastapistes strongia Munro, The marine and fresh water fishes of Ceylon, 1955, p. 248.

D. XII. 9 (10).1) A. III. 5. P. 1. 5. 10. V. I. 5. Sq. l. 46—50.

Ltr. $\begin{array}{c} 6\text{-}7 \\ \hline 1 \\ \hline 12\text{-}13 \end{array}$.

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1) In one specimen I find D. XI. 9.

Height equal to head, 2.3—2.6, 2.9—3.2 in length with caudal. Eye 2.8—3.4, equal to or scarcely shorter than snout. Interorbital space concave 1.7—2.4 in eye. Posterior nostril close before eye, anterior nostril with a flap, close to posterior one, and with a strong spine at its innerside. Supraorbital ridge with three spines. Superior postorbital ridge with three spines, inferior postorbital ridge with four spines. A spine between the last spines of the two ridges. Preorbital with one spine directed forwards and two spines directed backwards. Suborbital ridge closely below eye, without spines but ending in a small spine. A large preopercular spine, followed by a few smaller ones below it. Opercle with two flat spines. A spine on upper part of shoulder girdle. No groove behind eye. Posterior part of occiput scaly, rest of upper part of head naked. Opercle and upper part of preopercle scaly. The scales of the head, as well as those of the thoracal region smaller than those of sides of body, which are ctenoid. About 7 rows of scales before dorsal. Mouth somewhat oblique. Maxillary not quite reaching to below hindborder of eye. Villiform bands of teeth in jaws, on vomer and on palatines. Origin of dorsal above middle of opercle. First dorsal spine less than eye; spines increasing in length to the fourth and fifth, which equal postorbital part of head in length. Spines decreasing in length posteriorly, the eleventh between the first and second in length, the twelfth between the second and third. Soft dorsal slightly rounded, the longest rays about equal to longest dorsal spines. Origin of anal below last dorsal spine, which is as long as first anal spine. Second anal spine longest, somewhat longer than longest dorsal spines. Soft

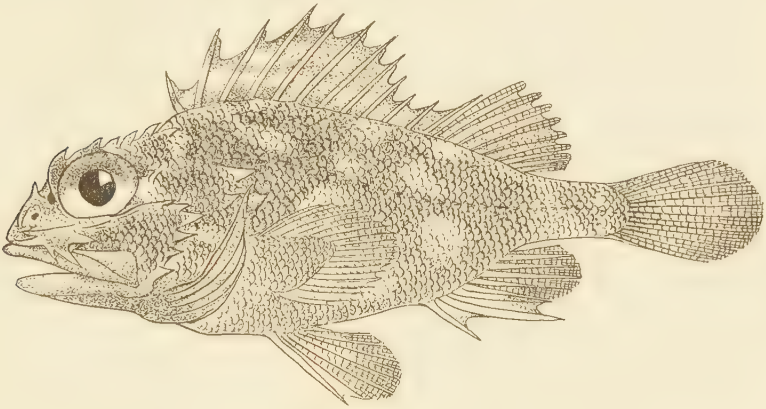

Fig. 4. *Sebastapistes strongia* (C. V.). × $^5/_3$.

anal almost truncate, the longest rays scarcely longer than longest dorsal rays. Pectorals equal to head without snout, its upper rays branched, its lower rays simple. Ventrals slightly shorter than pectorals. Caudal slightly rounded. Colour of preserved specimens light reddish, irregularly banded and marmorated with dark brown. Head and body generally covered with minute white spots. Fins transparent brownish. Length 150 mm.

Habitat: Talaut Islands!; Sula Islands!; Kabaëna!; Binongka!; Obi; Buru; Ambon; Banda! — Red Sea, Maldives, Chago Archipelago, Ceylon, Andamans, Philippines, Australia, Strong Island, New Hebrides, Samoa. In sea, on coral reefs.

Note. As Klunzinger and Weber have remarked, the description of the coloration of *strongia* by Cuvier & Valenciennes: "blanchâtre, toute persillée de noirâtre" has to be read as: "noirâtre, toute persillée de blanchâtre", as the figure given by Quoy & Gaimard l.c. and apparently based on the type, shows a dark fish, punctulated with white.

2. **Sebastapistes rhodochrous** (Gthr.)

Sebastes rhodochrous Günther, Proc. Zool. Soc. London 1871, p. 659.
Sebastichthys rhodochrous Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 19.
Sebastes hexanema Günther, Challenger Rep. Zool. I, Part VI, 1880, p. 40.
Sebastes hexanema Alcock, Ann. Mag. Nat. Hist. (6) VIII, 1891. p. 23. — Descr. Cat. Indian Deep-Sea Fishes, 1899, p. 27.
Pontinus hexanema Goode & Bean, Oceanic Ichthyol. 1895, p. 523.
Crossoscorpaena hexanema Fowler, Proc. U. S. Nat. Mus. LXXXV, 1938, p. 75.
Sebastes hexanema Herre, Mem. Indian Mus. XIII, part III, 1941, p. 373.
Sebastichthys rhodochrous Koumans, Temminckia IX, 1953, p. 256.

D. XII. 10. A. III. 5. P. 16. V. I. 5. Sq. l. about 50—54.
Ltr. $\begin{array}{c}6\text{-}7\\ \underline{1}\\ 12\text{-}13\end{array}$.

Height 2.9, 3.4 in length with caudal. Head 2, 2.5 in length with caudal. Eye 3.8, equal to snout. Interorbital space concave, the orbital rims being elevated, 3.7 in eye. Supraorbital ridge with two spines, superior postorbital ridge with three spines, inferior postorbital ridge with three spines, all spines very low. Preorbital with three spines, the anterior one directed forwards, the second obliquely downwards, and the third vertically downwards. Suborbital ridge with four low spines. A well developed preopercular spine with two smaller ones below it. Opercle with two flat spines. Eleven or twelve scales between ociput and origin of dorsal; these scales and those of head cycloid, those of body ctenoid. Maxillary reaching about to below middle of eye. Villiform bands of teeth in jaws, on vomer and on palatines. Origin of dorsal slightly behind middle of opercle. First dorsal spine less than eye; third to fifth spines subequal, equal to eye; the eleventh spine as long as the first, the twelfth as long as the ninth. Soft dorsal somewhat rounded, higher than spinous one. First anal spine very small, second one longest and strongest, much longer than dorsal spines, almost as long as eye and snout together. Pectoral less than head without snout, all pectoral rays simple. Ventrals slightly shorter than pectorals. Caudal rounded. Colour of preserved specimens brown. A dark blotch at base of dorsal between 7th to 10th spines. Length over 200 mm.

Habitat: Celebes (Menado)!; Sulu Sea; Off the Kei Islands, 252 m! — Andaman Sea, 238—396 m.

Note. The above description is made after the type of the species in the British Museum, where I have compared it with the type of *S. hexanema.*

3. **Sebastapistes amplisquamiceps** Fowler (Fig. 5, p. 28)

Sebastes hexanema M. Weber, Siboga Exp. Fische, 1913, p. 491 (nec Gthr.).
Scorpaena amplisquamiceps Fowler, Proc. U. S. Nat. Mus. 85, 1938, p. 55.
Scorpaena amplisquamiceps Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 399.

D. XII. 9—10. A. III. 5. P. 2. 7. 10 or 2. 9. 9. V. I. 5. Sq. l. 38 — 40. Ltr. $\begin{array}{c}4\text{-}5\frac{1}{2}\\ \hline 1\\ \hline 9\text{-}10\end{array}$.

Height 2.8—3.2, 3.6—3.7 in length with caudal. Head 2.2—2.6, 2.7—3 in length with caudal. Eye 3.2—3.3, equal to or somewhat more than snout. Interorbital space concave, 2.5 in eye. Mouth somewhat oblique, maxillary reaching to below middle of eye or somewhat farther. Villiform teeth in the jaws, on the vomer, and in a narrow band on the palatines. Anterior nostril with a fringed tentacle. A short spine at the inner side of the interspace between anterior and posterior nostrils. Supraorbital ridge with three spines, the first of which is more or less erect, the others pointing backward. A filament behind the first, and a longer one behind the second spine. Interorbital ridges diverging anteriorly and posteriorly, ending posteriorly in the first spine of the superior postorbital ridge. Two preorbital spines, pointing outwards, the posterior one also backwards, both with filaments. Superior postorbital ridge with three spines, inferior postorbital ridge with one spine. Infraorbital ridge with four spines. All these spines point backwards. Preopercle with a large spine and a few small ones below it. Opercle with two flat spines. A flat scapular spine. Sides of head scaly. Maxillary naked. Scales reaching on posterior part of head anteriorly to interorbital space. Origin of dorsal above middle of opercle. Third dorsal spine longest, equal to snout and half eye or slightly longer; first longer than penultimate spine and less than eye; last spine equal to eye. Longest ray of soft dorsal as long as longest spine. Origin of anal below second dorsal ray. First anal spine short, second longest and longer than longest dorsal spines. Soft anal slightly rounded. Ventrals equal to snout and eye. Pectorals rounded, the upper rays forked, the lower ones simple, slightly longer than ventrals. Caudal truncate. Several spines on the head have filaments, as also some of the scales on the body, specially those of the lateral line. Colour of preserved specimens pinkish or brownish. Length 162 mm.

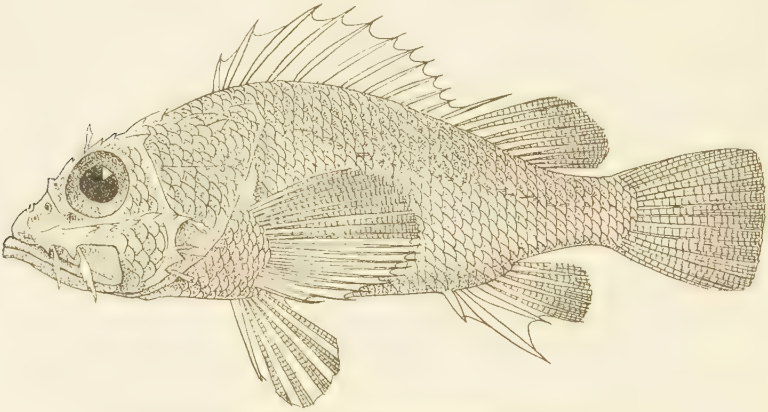

Fig. 5. *Sebastapistes amplisquamiceps* Fowler. × 3/4.

Habitat: Timor Sea, 216 m!; Strait Solor, 247 m! — Philippines, 180 m.

Note. The specimens recorded by M. Weber l.c. as *hexanema* are not this species, differing by having larger scales and by the postorbital part of the head being scaly. Moreover the upper pectoral rays are branched, whereas they are all simple in *hexanema* (= *rhodochrous*). They agree fairly well with Fowler's description of *amphisquamiceps*.

4. **Sebastapistes bynoensis** (Rich.)

Scorpaena bynoensis Richardson, Voy. Erebus & Terror, Fishes, 1845, p. 22.

Scorpaena bynoensis Günther, Cat. Brit. Mus. II, 1860, p. 113.
Scorpaena tristis Klunzinger, Verh. zool. bot. Ges. Wien XX, 1870, p. 802.
Scorpaena tristis Günther, Fische der Südsee I, 1873—1875, p. 77.
Scorpaena bynoensis Klunzinger, Sitzb. Akad. Wien 1880, p. 366.
Scorpaena bynoensis Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 131.
Scorpaena tristis Klunzinger, Fische des rothen Meeres I, 1884, p. 70.
Sebastapistes coloratus Gilbert, Bull. U. S. Fish. Comm. XXIII, Part II (1903) 1905, p. 627.
?*Sebastapistes laotale* Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 376.
Sebastapistes tristis Jordan & Seale, ibid. XXVI (1906) 1907, p. 37.
Sebastopistes tristis Evermann & Seale, ibid. p. 102.
Scorpaena bynoensis McCulloch, Rec. Western Austr. Mus. I (2), 1912, p. 96.
Sebastapistes bynoensis Whitley, Rec. Austr. Mus. XVI, No. 1, 1927, p. 29.
Sebastapistes bynoensis Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 289.
Sebastapistes tristic Herre, Notes Fish. Zool. Mus. Stanf. Univ. 1934, p. 65.
Sebastapistes bynoensis Fowler, Proc. Acad. Nat. Sci. Philadelphia LXXXVI, 1934, p. 77.
Sebastapistes bynoensis Herre, Field Mus. Nat. Hist. Zool. Ser. XXI, 1936, p. 263. — Philipp. Journ. Sci. 80, No. 4, 1952, p. 406.
Scorpaena bynoensis Matsubara, Trans. Sigenkagaku Kenkyusyo 2, 1943, p. 313.

D. XII. 9—10. A. III. 5. P. 14—17. V. I. 5. Sq. l. 38—45.

Ltr. $\begin{array}{c}6\\ \hline 1\\ \hline 10\text{-}11\end{array}$.

Height 2.5—2.6, 3.2—3.3 in length with caudal. Head 2.3—2.4, 2.8—3 in length with caudal. Eye 3.6—4.3, 1—1.27 in snout. Interorbital space concave, 1.6—2 in eye. Mouth slightly oblique. Villiform teeth in jaws, on vomer and on palatines. Interorbital ridges almost meeting in the middle, diverging anteriorly and posteriorly, where they are united by a ridge forming an angle pointing backwards. Well developed tentacles above eye may be present or absent. Fourth dorsal spine nearly as long as postorbital part of head; eleventh spine between first and second spines in length, and somewhat less than eye. The last spine equal to or somewhat shorter than third spine. Among the three anal spines the second one is by far the longest, and equal to or somewhat longer than postorbital part of head. First or first and second pectoral rays simple, following 3—6 forked, rest of rays again simple. Scales ctenoid on back and sides, cycloid below. Lateral line with 22—24 tubes. Colour of preserved specimens light brown, variegated with dark brown. Generally some large, dark, blotches below spinous part of dorsal, specially one below anterior part of the fin. Fins with patches or bands, anal with broader and narrower bands, the broader ones bordered by blackish. Length 150 mm.

Habitat: Singapore; Borneo (Sandakan); Bali. — Red Sea, Formosa, Philippines, Pelew Islands, Guam, Northern and Western Australia, New Hebrides, Rotuma, Fiji, Samoa, Rarotonga, Society Islands, Tuamotu Islands, Hawaii.

Note. I have not seen specimens of this species from the Indo-Australian Archipelago. The description is made after specimens of *S. bynoensis* and *S. tristis* in the British Museum, but I am not sure that all of them really belong to *bynoensis*. A specimen of *S. tristis* from the Cocos Keeling Islands has P. 15, all rays simple, and probably belongs to another species. Another one from the Red Sea has P. 1. 6. 8, the median rays forked, one from the Philippines has P. 1. 3. 10. Among the specimens labeled *S. bynoensis* two specimens from Queensland, have P. 1. 4. 11, and P. 2. 3. 11, another larger one (270 mm) also from Queensland, has P. 1. 5. 11, but this specimen most probably does not belong to *bynoensis,* as it has Sq. l. 55, Ltr. $\overset{7}{\underset{7}{\underline{1}}}$, and a rather deep occipital pit; it may be *S. cardinalis* Rich. Without having compared the types of *S. bynoensis* and *S. tristis* it is difficult to say if the two are identical. The type of *S. tristis* is from the Red Sea, that of *bynoensis* from the N.W. coast of Australia, but up to now, curiously enough, no specimens of either species have been recorded from the Indic proper.

Doubtful species

Sebastes marmoratus C. V. has been recorded by Kner (Novara Exp. Fische, 1865, p. 114) from Java and the Philippines. This species, which Jordan & Starks place in a genus of its own: *Sebastiscus,* is an inhabitant of Japanese and Chinese waters. As it has never been found again in the Philippines or in Java and as Kner's localities are often unreliable, the occurrence in the Indo-Australian Archipelago is doubtful.

5. **Scorpaenodes** Bleeker

(Bleeker, Nat. Tijdschr. Ned. Indië XIII, 1857, p. 371)

Sebastopsis Gill, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 278.
Sebastopsis Sauvage, Ann. Sc. Nat. (Zool.) V, 1873, p. 1.

Body covered with generally small scales, which are ctenoid or partly cycloid on belly. Head scaly, with exception of snout and anterior part of interorbital space. Ridges of head with well developed spines. No pit behind eyes. Villiform teeth in jaws, and on vomer, none on palatines. Dorsal originating above posterior part of opercle or behind it, with XIII spines and 8—9 (10) rays. Anal with III spines and 5 rays. Upper pectoral rays divided, lower ones simple. Gill mebranes free from isthmus and from each other.

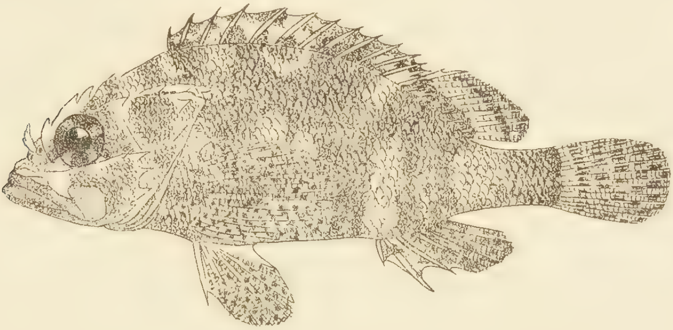

Fig. 6. *Scorpaenodes guamensis* (Q. G.). nat. size.

Distribution: Indo-Pacific.

Key to the Indo-Australian species of Scorpaenodes

a. Sq. l. about 41, 5—6 scales between last dorsal spine and lateral line . . . . 1. *S. guamensis* p. 31.
b. Sq. l. about 58, 9 scales between last dorsal spine and lateral line. . . . . 2. *S. muciparus* p. 34.

1. **Scorpaenodes guamensis** (Q. G.) (Fig. 6, p. 31)

Scorpaena guamensis Quoy & Gaimard, Voyage de l'Uranie et de la Physicienne, Zool. 1824, p. 326.
Sebastes minutus Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 348.
Scorpaena polylepis Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 173.
Scorpaena guamensis Günther, Fische der Südsee I, 1873—1875, p. 74 (sine syn.).
Sebastichthys strongia Day, Fishes of India, Part I, 1875, p. 148 (sine syn.).
Scorpaenopsis guamensis Day, ibid. p. 150. — Suppl. 1888, p. 788 (sine syn.).
Sebastichthys minutus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides p. 20.
Sebastopsis polylepsis Bleeker, ibid. p. 21. — Atl. Ichth. IX, 1879. Tab. CCCCXV. Fig. 1.
Sebastopsis minutus Sauvage, Nouv. Arch. Mus. Nat. Hist. (2) I, 1878, p. 121.
Sebastes (*Sebastopsis*) *guamensis* Klunzinger, Fische des rothen Meeres I,

1884, p. 71, p. 72 (sine syn.).
Sebastopsis guamensis Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1900, p. 521.
Sebastopsis guamensis Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 374.
Sebastopsis guamensis McCulloch, Rec. Austr. Mus. IX, No. 3, 1913, p. 388. — Mem. Queensl. Mus. VIII, Part III, 1921, p. 177.
Scorpaenodes guamensis Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 289. — Ibid. XI, No. 5, 1931, p. 349.
Sebastopsis guamensis Giltay, Bull. Mus. Hist. Nat. Belg. IX, No. 14, 1933, p. 12.
Scorpaenodes guamensis Herre, Field Mus. Zool. Ser. XXI, 1936, p. 261.
Scorpaenodes guamensis Matsubara, Trans. Sigenkagaku Kenkyusyo 2, 1943, p. 278.
Scorpaenodes guamensis Barnard, Ann. S. Afr. Mus. XXXVI, Part 5, 1948, p. 399.
Scorpaenodes guamensis J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed., 1950, p. 372.
Scorpaenodes guamensis Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 387.
Scorpaenodes guamensis Munro, The marine and fresh water fishes of Ceylon, 1955, p. 246.
Scorpaenodes guamensis Inger, Fieldiana 36. No. 3, 1957, p. 375.

D. XIII. 8—9. A. III. 5 (6). P. 1. 6. 12 or 1. 7. 10 or 1. 8. 10. V. I. 5, Ll. 41. Ltr. $\dfrac{5\text{-}6}{\dfrac{1}{10\text{-}11}}$.

Heigth 2.7—2.9, 3.3—3.7 in length with caudal. Head 2.2—2.6, 2.9—3.2 in length with caudal. Eye 4—4.5, slightly less than snout. Interorbital space concave, 1.5—1.7 in eye. Mouth somewhat oblique. Maxillary reaching almost to below hindborder of eye, its depth posteriorly less than eye, Villiform teeth in the jaws and on vomer, none on palatines. Head totally scaled, the scales on upper part of head, below eye and on snout much smaller than the others and more or less rudimentary on snout. Maxillary without scales but with minute folds of the skin, suggesting rudimentary scales. No very marked depression before eye. Posterior nostrils close before eyes, anterior ones with a flap. A short spine between and somewhat inwards of posterior and inferior nostril. Supraorbital ridge with 4 spines, directed backwards. Three spines on inferior, and two on superior postorbital ridges. No spine between the two ridges. Preorbital and suborbital spines not much developed, the last suborbital one the longest, on hindborder of preopercle which has a few smaller spines on its edge. Two opercular spines and one on superior part of shoulder girdle. Body covered with ctenoid scales, those on thoracal region and belly smaller than the others. Six irregular rows of scales between head and dorsal. Some of the spines, specially those of the supraorbital ridge, with hair-like filaments. Several scales of the lateral line with filaments. Origin of dorsal slightly before posterior border of opercle. First dorsal spine equal to half eye or somewhat longer, shorter than second, and more or less than twice in third spine. Fourth to eighth spines subequal and longer than the others, as long as snout. Twelfth spine as long as second one, 13th in length between second and third. Soft dorsal rounded, the longest rays almost equal to postorbital part of head. Origin of anal below 12th dorsal spine. First anal spine equal to or somewhat less than eye, second spine longer and stronger than third, equal to postorbital part of head. Soft anal somewhat rounded, the longest rays longer than second spine. Lower pectoral rays simple, upper ones forked; length of the pectoral about equal to head without snout; ventrals somewhat shorter. Caudal rounded. Colour of preserved specimens brownish, in young ones generally with dark brown, more or less regular cross bands, sometimes bordered with white lines. These bands indistinct in larger specimens, spreading and forming marmorations, often covering almost the whole body, and leaving a few lighter patches, or whitish spots and lines. A dark blotch on opercle generally distinct. Fins with rows of dark spots, generally spreading and forming large blotches, leaving a light network between them. Length 150 mm.

Habitat: Singapore; Strait Malacca! Pulu Berhala!; Sumatra (Padang); Batu Islands; Nias!; Java (Karangbollong); Bawean; Borneo (Pulo Bakkungaan Kechil); Celebes (Dongala!, Kwandang!, Menado, Gorontalo); Borneo Bank!; Marataea Island; Sangir Islands!; Karkaralong!; Sulu Islands!; Sula Islands!; Saleyer!; Kaledupa Islands; Sumba!; Ternate; Morotai; Obi major!; Buru; Ceram; Ambon!; Goram; Gisser!; Banda!; Damar!; Tiur!; Timor!; Kera near Timor; Samau!; Aru Islands!; Waigeu!; New Guinea (Manokwari, Wilhelmshafen, Kelana, Moresby Bay). — East coast of Africa, Red Sea, Ceylon, Andamans, Cocos Keeling Islands, Riu Kiu Islands, Philippines, Pelew Islands Guam, St. Mathias, Duke of York Island, Solomon Islands!, New Hebrides, Murray Island, North Queensland, Fiji, Lord Howe Island, Samoa, Tonfa Islands, Phoenix Islands, Society Islands. In sea, common on coral reefs.

Note. Günther, Klunzinger and Matsubara have united *Scorpaena rubropunctata* C.V. with *guamensis*, but Sauvage (Poissons de Madagascar, 1891, p. 294) who apparently re-examined the type specimen, says that it is different, having palatine teeth and being "un vraie Scorpène".

2. **Scorpaenodes muciparus** (Alc.)

Sebastes muciparus Alcock, Journ. Asiat. Soc. Bengal LVIII, 1889, p. 298. — Illustr. Zool. Investigator, 1894, Pl. XVIII, fig. 5.
Sebastes muciparus M. Weber, Siboga Exp. Fische, 1913, p. 491.

D. XIII. 9.1. A. III.5. P. 1.1.4.12. V. I. 5. Sql. 48—58. Ltr. $\begin{array}{c} 9 \\ \hline 1 \\ \hline 15 \end{array}$.

Height 2.8, 3.5 in length with caudal. Head 2.4, 2.9 in length with caudal. Eye 4.7, 1.5 in snout. Interorbital space nearly flat, 1.3 in eye. Mouth oblique. Maxillary reaching to below middle of eye. Villiform bands of teeth on jaws and on head of vomer. A symphysial knob of the lower jaw fitting into a notch between the premaxillaries. Margin of preorbital with four spines. Anterior nostril tubular, with a short flap. An elongated mucous pore between it and the posterior nostril. A pair of similar pores in middle of interorbital space, which is covered with minute scales; a longitudinal furrow in its middle. A median mucous pore in the posterior part of the interorbital space, its transverse mucous canal separating the interorbital space from the occipital region, which is flat and covered with minute scales. Four supraorbital spines, arranged in pairs, the middle of the supraorbital ridge being smooth. Superior and inferior postorbital ridges each with three spines. Suborbital ridge with seven spines. A strong preopercular spine at the end of the suborbital ridge, a few blunt spines along the posterior preopercular edge below it. Two flat opercular spines. A blunt scapular spine. Preopercle and opercle with feebly ctenoid scales, larger than those of upper part of head, specially the posterior ones. Origin of dorsal below origin of pectorals. Dorsal spines increasing in length to the sixth spine, which nearly equals snout in length. Twelfth spine less than half length of first; last dorsal spine as long as eleventh spine. Soft dorsal acutely rounded, the longest ray as long as snout and half eye. Origin of anal below last dorsal spine. First anal spine minute, second one strongest but shorter than the third, slender spine, which is as long as longest dorsal spine. Longest anal rays about as long as longest dorsal rays. Pectorals longer than head without snout, ventrals as long as postorbital part of head. Caudal slightly rounded. Lateral line consisting of 23 pores, preceded by small spines. Scales of upper part of body ctenoid and much smaller than those of sides and belly, which are partly cycloid. Colour of preserved specimens pinkish, fins yellowish hyaline. Length 193 mm.

Habitat: Solor Strats, 247 m! — Bay of Bengal, 81 m.

Note. Only two specimens of this species are known, Alcock's type, 94 mm long, from the Bay of Bengal and the specimen recorded by Weber, 193 mm long (not 183 mm, as stated by Weber). The above description is made after last-named specimen; it differs in several details from Alcock's description, but this may be due to the great difference in size between the two specimens.

6. **Setarches** Johnson

(Johnson, Proc. Zool. Soc. London 1862, p. 177)

Lioscorpius Günther, Rep. Challenger, Zool. VI, 1880, p. 40.
Bathysebastes Steindachner & Döderlein, Denkschr. Akad. Wien XLIX, 1883, p. 207.

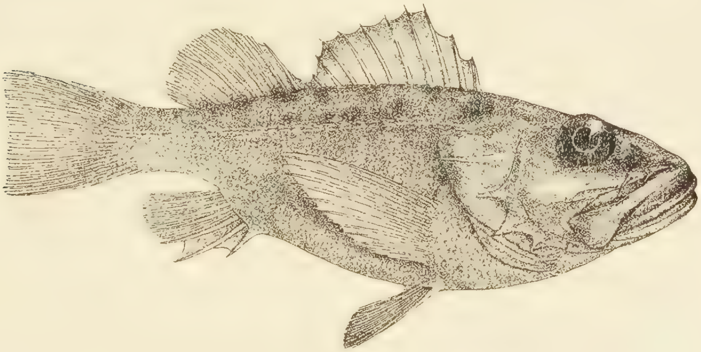

Fig. 7. *Setarches güntheri longiceps* (Gthr.) after Günther

Body covered with small cycloid scales, throat naked. Each tube of lateral line extending over several scales. Head scaleless above, preopercle and opercle scaly, the scales of the opercle more or less deciduous. Ridges and spines of head rudimentary, with exception of the preorbital, preopercular and opercular spines, which are long and slender. Head without preorbital or postorbital pits. Dorsal originating above posterior part of opercle, with XII spines and 9-11 rays, the eleventh spine minute, hence suggesting two dorsal fins. Anal with III spines and 5 rays. Upper pectoral rays divided, with exception of the first which is simple as the lower rays. Ventrals with one spine and 5 rays. Gill opening wide, gill membranes free from each other and from isthmus.

Distribution: Atlantic and Indo-Pacific, at moderate depths.

1. **Setarches güntheri longiceps** (Gthr.) (Fig. 7, p. 35)

Lioscorpius longiceps Günther, Rep. Challenger. Zool. VI, 1880, p. 40.

Bathysebastes albescens Steindachner & Döderlein, Denkschr. Akad. Wien XLIX, 1883, p. 207.

Setarches fidjiensis Günther, Rep. Challenger. Zool. XXII. Deep Sea Fishes, 1887, p. 19.

Bathysebastes albescens Günther, ibid. p. 20.

Lioscorpius longiceps Alcock, Ann. Mag. Nat. Hist. (6) VIII, 1891, p. 23.

Setarches fidjiensis Goode & Bean, Oceanic Ichthyol. 1895, p. 263.

Setarches albescens Jordan & Starks, Proc. U.S. Nat. Mus. XXVII, 1903, p. 138.

Setarches Güntheri Brauer, Valdivia Exp. Tiefseefische. Syst. Theil. 1906, p. 294.

Setarches güntheri M. Weber, Siboga Exp. Fische, 1913, p. 492.

Setarches güntheri J. L. B. Smith, Trans. Royal Soc. S. Africa XXII, 1934, p. 97.

Setarches marleyi Fowler, Proc. Acad. Nat. Sci Philadelphia LXXXVII, 1936, p. 398.

Setarches marleyi Norman, Sc. Rep. John Murray Exp. VII, No. 1, Fishes, 1939, p. 93.

Setarches longiceps J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950, p. 370.

Setarches güntheri Herre, Philipp. Journ.Sci. 80, No. 4, 1952, p. 441.

D. XII. 9—11. A. III. 5. P. 1. 13. 6—8, or 1. 14. 6 or 1. 1. 12. 7.

Sq. l. 80. Ltr. $\begin{matrix}12\\ -_{1}\\ 27\end{matrix}$.

Height 2.8—2.9, 3.5—3.6 in length with caudal. Head 2.3—2.4, 2.9—3 in length with caudal. Eye 4.1—5.3, 1.2—1.6 in snout and 1.1—1.3 in flat interorbital space. Mouth oblique. Maxillary reaching almost to below hindborder of eye. Narrow villiform bands of teeth in the jaws, on vomer, and on palatines. Sides of head scaly. Preorbital with three rather long spines, the anterior one directed forwards, the last one backwards. Supraorbital ridge and postorbital ridges feebly developed, with indications of spines only. An oblong shallow fontanel, partly interorbital, partly postorbital. Suborbital ridge without spines. Three strong preopercular spines, two opercular spines. About ten scales before dorsal, the origin of which is slightly before that of pectorals and above second half of upper border of opercle. First dorsal spine equal to half eye or somewhat longer, fourth spine longest and as long as distance between hindborder of eye and upper end of gill opening. Penultimate spine minute, last dorsal spine in length between second and third dorsal spines. Soft dorsal somewhat rounded, slightly higher than spinous part. Origin of anal below first dorsal ray; first anal spine very small, third longest and equal to or slightly longer than fourth dorsal spine. Longest anal rays longer than dorsal ones. Pectorals long, reaching on anus, as long as distance between upper end of gill opening and anterior preorbital spine. Ventrals as long as distance between that spine and posterior border of eye. Caudal truncate. Colour of preserved specimens uniform yellowish or brownish. In very young specimens the spinous dorsal has a black terminal border. Length 300 mm.

Habitat: Northwest coast of Sumatra, 296 m; Bali Sea, 289 m!; Strait Macassar, 450 m!; Molucca Strait, 397 m!; Arafura Sea, 204 m!; near Kei Islands, 560 m! and 232 m. — Natal coast, coast of East Africa, 977 m, Zanzibar area, 640—732 m, Bay of Bengal, Andaman Sea, Philippines, Japan, Fiji, Hawaii. In sea, in deep coastal waters.

Note. Norman suggested that all Indo-Pacific specimens of *Setarches* belong to one species, which differs from the Atlantic *S. güntheri*: "in the lower dorsal fins, rather shorter maxillary, the shape of the occipital fontanel and in other minor characters". I only have seen specimens from the Indo-Australian Archipelago, but according to the descriptions the differences between *güntheri* and *longiceps* are very slight. I have treated them here as subspecies of *S. güntheri*. The synonymy is tentative.

7. **Pterois** (Cuvier) Oken

(Cuvier, Règne Animal II, Ed. 1. 1817, p. 286; "Les Pterois". — Oken, Isis 1817, p. 1183)

Pseudomonopterus Klein, Hist. Piscium Nat. 1749 (pre-Linnean).
Pseudopterus "Gesellschaft Schauplatz" III, 1776, p. 153 (no author's name).
Brachiurus Swainson, Nat. Hist. Fishes, etc. II, 1839, p. 71.
Dendrochirus Swainson, ibid. p. 180.
Brachyurus Swainson, ibid. p. 264.
Nemapterois Fowler, Proc. U. S. Nat. Mus. LXXXV, 1938, p. 81.

Oblong, rather compressed. Body and tail and at least sides of head covered with small or moderate cycloid or ctenoid scales. Head with distinct ridges and spines. Preorbital without spines. Tentacles or filaments on different parts of head, amongst which supraorbital ones the most constant. Villiform teeth in the jaws and on vomer, none on palatines. Origin of dorsal above opercle. Dorsal with XII-XIII spines and 9—12 rays, somewhat notched, the penultimate spine being shorter than the others. Membranes of spinous dorsal attached to almost full length of posterior side of each spine, but only at the base of the following spine, hence very deeply incised. Median dorsal spines very long, much longer than depth of body. Anal with III spines and 5—7 (8) rays. Pectorals with 12—18 rays, either all simple or the median ones deeply forked. Membranes of lower pectoral rays always deeply incised, those of median and upper rays generally leaving a great part of the rays free, which form long filaments, often reaching to caudal or beyond. Ventrals with one spine and 5 rays, connected by membrane. Caudal rounded or somewhat pointed.

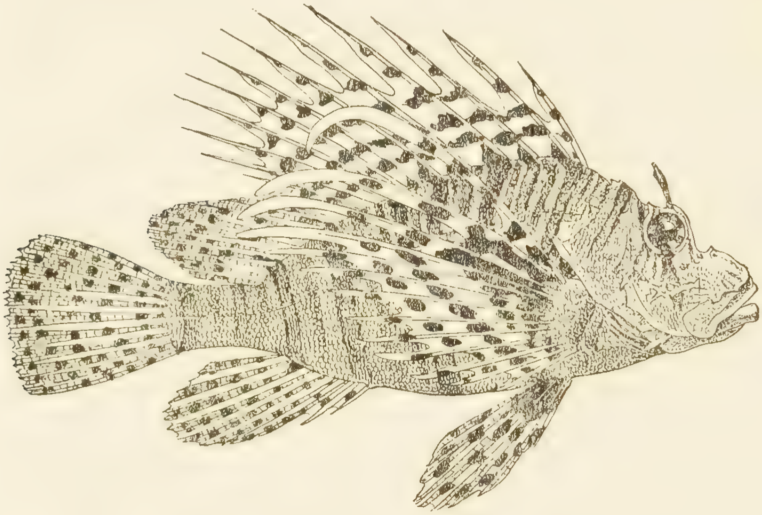

Fig. 8. *Pterois volitans* (L.) × 1/3.

Distribution: Indo-West Pacific.

Key to the Indo-Australian species of Pterois

I. All pectoral rays simple, the upper ones free and filamentous for their greater part, and reaching on caudal or beyond (*Pterois* s. str.)
  a. Thirteen dorsal spines. Scales cycloid. P. 12—16.
    a^1. 91—106 transverse rows of scales above

l. l. Ltr. $\begin{array}{c}12-14\\\hline 1\\\hline 19-21\end{array}$ . . . . 1. *P. volitans* p. 39

b¹. 80—88 scales above l. l. Ltr. $\begin{array}{c}9-10\\\hline 1\\\hline 15-18\end{array}$ 2. *P. russelli* p. 42

c¹. About 69 scales above l. l. Ltr. $\begin{array}{c}8\\\hline 1\\\hline 14-15\end{array}$ 3. *P. lunulata* p. 44

b. Twelve dorsal spines. Scales ctenoid. P. 16—17. 50—54 scales above l. l. Ltr. $\begin{array}{c}7-8\\\hline 1\\\hline 10-13\end{array}$.

a¹. Yellowish with broad transverse brown bands . . . . 4. *P. antennata* p. 45

b¹. Brown, crossed by about 8 white transverse lines . . . . 5. *P. radiata* p. 47

II. With exception of the first or first and second, the upper pectoral rays are deeply forked [1] and connected by membranes almost to their ends. Pectorals not reaching caudal. Thirteen dorsal spines (*Brachirus* or *Dendrochirus*).

a. 50—55 transverse rows of scales above l. l. Ltr. $\begin{array}{c}7-8\\\hline 1\\\hline 11-12\end{array}$. Soft dorsal with rows of dark spots. Ventrals dark, with a few light spots near tip of fin . . . . 6. *P. zebra* p. 47

b. 41—49 rows of scales above l. l. Ltr. $\begin{array}{c}6\\\hline 1\\\hline 11-12\end{array}$. Soft dorsal with rows of dark spots. Ventrals light with 4—5 dark transverse bands . . . . 7. *P. brachyptera* p. 49

c. 43 rows of scales above l. l. Ltr. $\begin{array}{c}6\\\hline 1\\\hline 14\end{array}$. Soft dorsal with two large, white edged ocelli. Ventrals dark, edged with white and with some light spots in posterior part of fin 8. *P. biocellata* p. 51

1. **Pterois volitans** (L.) (Fig. 8, p. 38).

Gasterosteus volitans Linné, Syst. Nat. Ed. 10. 1758, p. 296.
Scorpaena volitans Bloch, Ausländ. Fische III, 1787, p. 18.
Scorpaena miles Bennett, Fishes of Ceylon, London, 1928, p. 9.

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1) In young specimens most pectoral rays may be simple.

Pterois volitans Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 352.
Pterois muricata Cuvier & Valenciennes, ibid. p. 363.
Pterois volitans Bleeker, Verh. Bat. Gen. XXII. Bijdr. kennis Scleroparei, 1849, p. 7.
Pterois volitans Günther, Cat. Brit. Mus. II, 1860, p. 122.
Pterois miles Günther, ibid. p. 125.
Pterois volitans Klunzinger, Verh. zool. bot. Ges. Wien XX, 1870, p. 806.
Pterois volitans Günther, Fische der Südsee I, 1873—1875, p. 81.
Pterois miles Day, Fishes of India, Part I, 1875, p. 153.
Pterois volitans Day, ibid. p. 154.
Pseudomonopterus (*Pterois*) *volitans* Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 42. Atl. Ichth. IX, 1879. Tab. CCCCXII. Fig. 3.
Pterois volitans Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 135.
Pterois volitans Klunzinger, Fische des rothen Meeres I, 1884, p. 73.
Pterois muricata Sauvage, Poissons de Madagascar, 1891, p. 300.
Pterois volitans Jordan & Starks, Proc. U. S. Nat. Mus. XXVII, 1903, p. 142.
Pterois volitans Popta, Notes Leyden Mus. XXIII, 1903, p. 169.
Pterois volitans Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 379.
Pterois volitans Franz, Abh. Bayer. Akad. IV. Suppl. 1 Abth. 1910, p. 72.
Pterois volitans McCulloch, Austr. Zoolog. II, Part III, 1922, p. 118.
Pterois volitans Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 912.
Pterois volitans Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 292.
Pterois miles Fowler, l.c. — Proc. Acad. Nat. Sci. Philadelphia 86, 1934, p. 483.
Pterois volitans Matsubara, Trans. Sigenkagaku Kenkyusyo 2, 1943, p. 341.
Pterois miles Blegvad, Danish Sci. Inv. Iran. Part III, 1944, p. 189.
Pterois volitans J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950, p. 373.
Pterois volitans Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 427.
Pterois volitans Munro, The marine and fresh water fishes of Ceylon, 1955, p. 245.

D. XIII. 10—11 (12). A. III. 7 (8). P. 14. V. I. 5. Sq. l. 91—106. Ltr. $\begin{array}{c}12\text{-}14\\ \hline 1\\ \hline 19\text{-}21\end{array}$

Height 2.7—2.9, 3.4—4.2 in length with caudal. Head 2.7—2.8, 3.3—3.9 in length with caudal. Eye 3.7—4.8, 1.4—2.1 in snout. Interorbital space, which is very concave, and better described as a deep groove, the eyes being prominent, somewhat more or less than eye. Mouth oblique. Maxillary reaching to below middle of eye in young specimens, to below frontborder of eye in large ones. Villiform teeth in jaws and on vomer, none on palatines. Interorbital space, occipital region, and sides of head covered with small cycloid scales. Nostrils rather close together, the anterior one with a posterior filament; a spine immediately behind anterior nostril. Supraorbital ridge with two blunt spines, the first one with a long filament; a short filament on upper part of eye. Interorbital space with two parallel low ridges, better developed in old than in young specimens, widening behind eye and running again parallel to the high but short superior postorbital ridges, which carry 2 or 3 spines. Suborbital ridge smooth in young specimens, in adults with a number of small, blunt, irregular spines, ending in a blunt and rather short spine on preopercular edge, which has two more spines, not much shorter than the upper one. Inferior postorbital ridge with 3 or 4 low and blunt spines, scarcely developed in young ones. A suprascapular spine. Adult specimens with a flat opercular spine. First dorsal spine as long as snout in young ones, as long as snout and eye in adults. Eighth to eleventh spines longest, somewhat longer than base of spinous dorsal, 12th spine generally shorter than first, 13th spine shorter or longer than 12th. Soft dorsal rounded, the median, longest rays about as long as second dorsal spine. First anal spine shorter than the second one, third longest, about as long as snout. Soft anal rounded, the longest rays about as long as second dorsal spine. Pectoral rays all simple, the upper and lower ones only connected by membrane in their basal part; in the median rays the membrane is better developed; the lower rays more or less fleshy; in young specimens the longest pectoral rays reach far beyond the caudal, in specimens of 200 mm they reach to the end of the caudal, in larger specimens to the end of the dorsal. Ventrals with well developed membranes, slightly longer than head in large specimens, much longer than head in smaller ones. Caudal rounded. Scales cycloid. Colour of preserved specimens reddish, Head, body, and tail covered with darker or lighter brown bands and generally much narrower light bands, transverse on body and tail, somewhat perpendicular on head, and running from occiput to snout through interorbital space. These bands more or less obsolete in large specimens. Dorsal, anal, caudal, and pectorals light, the spines and rays with dark blotches, forming more or less regular longitudinal rows on dorsal and anal, and transverse rows on caudal and pectorals. Membrane of pectorals often dark brown. Ventrals dark brown with small whitish or yellowish spots or the fin is light, the rays with black blotches as in the other fins. Length 370 mm.

Habitat: Pulu Weh!; Sumatra (Tandjong, Benkulen, Padang!, Priaman, Siboga); Batu Islands, Nias!; Bintang; Banka; Java (Jacarta, Karangbollong, Tjilatjap, Prigi, Pasuruan); Bawean; Celebes (Makassar, Amurang, Menado, Tombariri); Sangir Islands; Sumbawa!; Timor; Letti; Sula Islands!; Ternate; Buru; Ceram; Ambon; Nusa laut; Banda!; New Guinea (Manokwari, Port Moresby, Madang). — East coast of Africa from Mossel Bay to Natal, Mozambique, Daressalam, Zanzibar, Madagascar, Réunion, Mauritius, Seychelles, Red Sea, Persian Gulf, coasts of India, Ceylon, Andamans, Siam, Christmas Island, Malay Peninsula, Paracel Islands, coasts of China, Southern Japan, Riu Kiu Islands, Formosa, Bonin Islands. Philippines, Pelew Islands, Queensland, New South Wales, Marshall Islands, Nauru, New Britain, Woodlark Island, Santa Cruz Islands, New Hebrides, Lord Howe Island, Kermadec Island, Gilbert Island, Fiji, Rotuma, Samoa, Society Islands, Marquesas Islands, Tuamotu Archipelago. In sea, on coral reefs.

2. **Pterois russelli** Bennett

Pterois Russelli Bennett, Proc. Comm. Zool. Soc. London I, 1831, p. 128.
Pterois miles Cantor, Journ. Asiat. Soc. Bengal XVIII, Part II, 1950, p. 1024 (nec. Benn.).
Pterois kodipungi Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 450.
Pterois kodipungi Günther, Cat. Brit. Mus. II, 1860, p. 124, p. 520.
Pterois Russellii Day, Fishes of India, Part I, 1875, p. 152.
Pseudomonopterus (*Pterois*) *kodipungi* Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 45. — Atl. Ichth. IX, 1879. Tab. CCCCXV. Fig. 5.
Pterois lunulata Fowler, Proc. Acad. Sci. Philadelphia LV, 1903, p. 166 (nec Schl.).
Pterois miles Gilchrist & Thompson, Ann. S. Afric. Mus. VI, part 2, 1908, p. 175 (nec. Benn.).
Pterois kodipungi Barnard, ibid. XXI, part 2, 1927, p. 913.
Pterois Russelli Chevey, Trav. océanogr. Indochine. 4e. Mém. 1932, p. 117.
Pterois russellii Fowler, Proc. Acad. Nat. Sci. Philadelphia LXXXVI, 1934, p. 484.
Pterosis russellii Blegvad, Danish Sci. Invest. Iran, Part III, 1944, p. 188.
Pterois russellii J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950 p. 373.
Pterois russelli Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 426.
Pterois russelli Munro, The marine and fresh water fishes of Ceylon, 1955, p. 246.

D. XIII. 10—11 (12). A. III. 7 (8). P. 12—13 (14). V. I. 5.

Sq. l. 80—88. Ltr. $\dfrac{9\text{-}10}{\dfrac{1}{15\text{-}18}}$.

Height 2.7—3.2, 3.7—4.4 in length with caudal. Head 2.7—3.1, 3.7—4.2 in length with caudal. Eye 3.3—5, 1.4—1.9 in snout and more than very concave interorbital space. Mouth oblique. Maxillary reaching to below frontborder of eye in young, to below middle of eye in older specimens. Villiform teeth in jaws and on vomer, none on palatines. Interorbital space, occipital region, and sides of head covered with small cycloid scales. Nostrils rather close together, the anterior ones with a well developed flap; a spine behind anterior nostril not always distinct. Supraorbital ridge with two blunt spines, a filament before the first one. Interorbital space with two parallel ridges, connected behind by a transverse ridge in the form of a angle, the point of which is directed backwards, continued into the high superior postorbital ridges, which have two blunt spines. Suborbital ridge smooth or nearly so in young ones, in adults with a number of blunt spines, and ending on preopercular edge with a short spine. Two short spines below it on preopercular edge. Inferior postorbital ridge consisting of two short, compressed, separate spines. A small suprascapular spine. A flat opercular spine. First dorsal spine as long as snout, the 6th longest and as long as head, the 12th somewhat shorter than the 13th, which is about as long as the first one. Soft dorsal rounded, the longest ray as long as head or half length of snout shorter. First anal spine shorter than second one, third one longest, as long as snout. Soft anal rounded, longest rays about as long as longest dorsal rays. Pectoral rays all simple, the first to third connected by membrane only at their base, the third to ninth connected by membrane for more than half their length or less. In young specimens the longest pectoral rays far surpass the caudal, in older ones reaching on caudal. Ventrals as long as head in larger specimens, shorter than head in young ones. Caudal somewhat pointed. Scales cycloid. Colour of preserved specimens light yellowish, transversely striped with broader and narrower brown bands. A brown band from snout to occiput. Some of the bands on body continued on the narrow membranes of spinous dorsal. Soft dorsal, anal, and caudal hyaline, at most with a few dark spots, seldom the soft anal is spotted. Pectorals yellowish with transverse rows of dark spots on the rays; the membrane of the median part of the fin often grey or bluish. Ventrals light with dark spots on the rays or darkish with light spots on the rays. Length 270 mm (Specimens of *P. kodipungi* of Bleeker's collection in the Amsterdam Museum examined)

Habitat: Singapore; Pulu Weh!; Sumatra (Padang, Ulukan, Trussan, Tiku, Priaman, Siboga, Tandjong); Nias; Batu Islands; Banka; Java (Jakarta!); Borneo (Balikpapan!); Celebes (Amurang); Saleyer!; — Cost of Natal, Zanzibar, Mauritius, Persian Gulf, coasts of India, Ceylon, Indochina, Pinang, Philippines, Queensland?.

Note. Günther l.c. mentions a specimen from "Australia".

As this species never has been found eastward of Celebes the occurrence in Australia is doubtful.

3. **Pterois lunulata** Schl.

Pterois lunulata Schlegel, Fauna Japonica, Poissons, 1842, p. 46.
Pterois lunulata Bleeker, Verh. Akad. Amsterdam I (1851) 1853. Bijdr. kennis Ichth. fauna Japan, p. 3.
Pterois lunulata Günther, Cat. Brit. Mus. II, 1860, p. 124.
Pterois lunulata Steindachner, Sitzber. Akad. Wien LX, 1869, p. 561.
Pseudomonopterus (Pterois) lunulatus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 47. Atl. Ichth. IX, 1879. Tab. CCCCXI. Fig. 4.
Pterois lunulata Steindachner & Döderlein, Denkschr. Akad. Wien XLIX, 1884, p. 199.
Pterois lunulata Steindachner, Ann. Hofmuseum Wien XI, 1896, p. 203.
Pterois lunulata Jordan & Starks, Proc. U. S. Nat. Mus. XXVII, 1903, p. 142.
?*Pterois lunulata* Fowler, Proc. Acad. Nat. Sci. Philadelphia LV, 1903, p. 166.
Pterois lunulata Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 293.
Pterois lunulata Matsubara, Trans. Sigenkagaku Kenkyusyo 2, 1943, p. 339.
Pterois lunulata Boeseman, Rev. Fishes Coll. Burger and von Siebold. Japan, 1947, p. 55.
Pterois lunulata Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 425.

D. XIII. 11 (12). A. III. 7 (8). P. 13. V. I. 5. Sq. l. about 69.

Ltr. $\begin{array}{c}8\\ \hline 1\\ \hline 14\text{-}15\end{array}$

Height 3, 4.1—4.7 in length with caudal. Head 2.75—3, 3.9—4.1 in length with caudal. Eye 4.2—4.3, 1.4—1.7 in snout and somewhat more than very concave interorbital space. Mouth oblique. Maxillary reaching to below frontborder of eye. Sides of head, and interorbital space with small cycloid scales. Spines of upper part of head as in *russelli*. Suborbital ridge smooth in young, as in *russelli* in adults. A flat opercular spine. Seventh and eighth dorsal spines subequal, as long as head. Soft dorsal rounded, length of the longest rays between that of second and third spines. Anal spines increasing in length to the third, which is as long as snout, or somewhat longer than snout. Pectoral rays all simple, the anterior rays connected by membranes basally, the following ones for much more than half their length. Pectorals reaching to end of caudal in young, to end of dorsal in adults. Ventrals longer than head in young, about as long as head in adults. Scales cycloid. Colour of preserved specimens greyish brown with brown transverse bands on the back. A dark blotch at opercular flap. Fins hyaline, excepting the pectorals, the membranes of which have irregular, more or less curved, dark bands, and the ventrals, which are white, with narrow, transverse brown bands. Length 310 mm. (Description made after Japanese specimens of Bleeker's collection in the Leiden Museum, long 127—267 mm).

Habitat: Singapore; Sumatra?; Arafura Sea. — Zanzibar, Aden, Muscat, Paracel Islands, Korea, Quelpart Island, China, Japan, Philippines, Queensland.

Note. Fowler (Journ. Acad. Nat. Sci. Philadelphia (2) XII, Part 4, 1904, p. 548) records a specimen of this species from Sumatra, but as he described and figured a *Pterois* as *lunulata,* which in reality is *russelli* (see synonyms of this species) in the previous year, I am not quite sure that his determination of the Sumatra specimen is correct. *P. russelli* and *lunulata* are very nearly related, differing in the numbers of scales and in the colouring of the ventral and pectoral fins. Bleeker (l.c. 1876) gives as another difference the number of longitudinal rows of scales on the cheek: According to him there are 5—6 rows above, and 8—10 below the suborbital ridge in *russelli,* whereas these counts are 8—10 above and 6—7 below in *lunulata.* In specimens of both species examined by me I find that the very small scales below the suborbital ridge do not reach as far downwards in *lunulata* as in *russelli.* In the former I count 8 inferior scales, in the latter about 10.

4. **Pterois antennata** (Bl.)

Scorpaena antennata Bloch, Ausländ. Fische III, 1787, p. 21.
Pterois antennata Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 361.
Pterois antennata Lesson, Voyage Coquille. Zool. II. 1. Partie, Poissons, 1830, p. 212.
Pterois antennata Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 72.
Pterois antennata Günther, Cat. Brit. Mus. II, 1860, p. 124 (sine syn.).
Pseudomonopterus (*Pterois*) *antennatus* Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 48. — Atl. Ichth. IX, 1879, Tab. CCCCXIII. Fig. 5.
Pterois antennata Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 292.
Pterois antennata Whitley, Rec. Austr. Mus. XIX, 1933, p. 95.
Pterois antennata Matsubara, Trans. Sigenkaguku Kenkyusyo 2. 1943, p. 345.
Pterois antennata Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 264. — Philipp Journ. Sci. 80, No. 4, 1952, p. 424.

D. XII. 10—12. A. III. 6—7. P. 16—17. V I. 5. Sq. l. 50—54.

Ltr. $\begin{array}{c} 7\text{-}8 \\ \hline 1 \\ \hline 10\text{-}13 \end{array}$

Height 2.5—2.7, 3.2—3.5 in length with caudal. Head 2.5—2.7, 3.3—3.5 in length with caudal. Eye 3.3—3.7, 1.1—1.2 in snout and more than very concave interorbital space. Mouth oblique. Maxillary reaching to below middle of eye or not quite so far. Villiform teeth in jaws and on vomer, none on palatines. Occipital region, and sides of head covered with rather small ctenoid scales, interorbital space and snout scaleless. Nostrils rather close together, the anterior ones with a well developed flap. A pointed spine behind anterior nostril. Supraorbital ridge with a varying number of larger and smaller spines; a long tentacle above middle of eye. Two interorbital ridges, nearest together in the middle of the interorbital space, which is very narrow. These ridges ending with one or more spines, which are at the same time the beginning of the superior postorbital ridge, which is high and compressed posteriorly, bearing several spines. Suborbital ridge with a number of larger and smaller spines. Preopercular spines poorly developed. Inferior postorbital ridge with about 6 more or less developed spines. A minute suprascapular spine. The single, flat opercular spine poorly developed. First dorsal spine as long as snout and half eye; 7th or 8th spines longest, as long as distance between head and beginning of caudal peduncle. Soft dorsal rounded, the longest rays as long as head without snout. First anal spine much shorter than second; third longest, equal in length to postorbital part of head. Soft anal rounded, the longest rays somewhat longer than longest dorsal rays. Pectoral rays all simple, the upper ones connected by membrane up to the middle of their length or more, the six lower rays only connected basally. Longest pectoral rays surpassing end of caudal or reaching on caudal. Ventrals as long as head or a little shorter, some of the rays projecting far beyond the membrane. Caudal rounded. Colour of preserved specimens yellowish, transversely striped with broad, brown bands, generally with narrower bands in the interspaces between the broad ones, the narrow bands not reaching to the ventral side. Head with darker brown bands, separated by narrow white interspaces; one or two over nape and opercle, one over occipital part of head and hinder half of preopercle, and one, which generally is darker, through eye and cheeks. Vertical fins yellowish, more or less dotted with small dark blotches on rays. Pectorals bluish or grey, with large, dark, white edged ocelli, more or less arranged in rows. Ventrals light, mottled with greyish. Length 190 mm.

Habitat: Pulu Weh!; Singapore; Sumatra (Padang, Priaman); Java (Prigi, Cheribon!); Celebes (Menado); Papinga Island!; Sulu Islands!; Saleyer!; Solor; Samar; Sumbawa!; Gisser;

Ternate; Buru; Ceram; Ambon!; Goram; Banda!; Tenimber Islands; Aru Islands; Waigeu; New Guinea (Manokwari, Wilhelms-Hafen!). — Mauritius, Réunion, Seychelles, Southern Arabian coast, Muscat, coasts of India, Cochinchina, China, Marianas, Philippines, St. Mathias, New Britain, Solomon Islands, Western Australia, New Hebrides, Cook Island, Society Islands, Tuamotu Islands, Marquesas Islands.

5. **Pterois radiata** C. V.

Pterois radiata Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 369.
Pterois cincta Rüppel, Neue Wirbelthiere, 1835—1840, p. 108.
Pterois cincta Günther, Cat. Brit. Mus. II, 1860, p. 125.
Pterois cincta Klunzinger, Verh. zool. bot. Ges. XX, 1870, p. 806.
Pterois radiata Günther, Fische der Südsee I, 1873—1875, p. 81.
Pterois cincta Day, Fishes of India, Part I, 1875, p. 154.
Pterois radiata Klunzinger, Fische des rothen Meeres I, 1884, p. 73.
Pterois radiata Day, Fauna of British India, Fishes II, 1889, p. 63.
Pterois radiata Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 379.
Pterois radiata Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 293.
Pterois radiata Pietschmann, Bull. B. P. Bishop Mus. 73, 1930, p. 17.
Pterois radiata Herre, Zool. Ser. Field Mus. XXI, 1936, p. 265.
Pterois radiata Matsubara, Sigenkagaku Kenkyusyo 2. 1943, p. 343.

This species is very close to *antennata,* but differs by its colouring. The colour in alcohol is brown, crossed by about 8 white transverse lines, some of them furcated in their upper or lower parts. Two broader longitudinal lines on the caudal peduncle, often united anteriorly. (Not seen by me).

Habitat: Sipora Island, at west coast of Sumatra. — Island of Johanna near Zanzibar, Red Sea, Andamans, Marshall Islands, Gilbert Islands, Ellice Islands, Fidji, Samoa, Tonga Islands, Cook Islands, Society Islands, Tuamotu Islands, Marquesas Islands, Thorton Island, Washington Island, Howland Island, Hawaii.

Note. The distribution of this species is curious. It occurs in the Indic as well as in the Pacific, but seems to be absent in the most western part of the Pacific.

6. **Pterois zebra** Q. G.

Pterois zebra Quoy & Gaimard, Voyage de l'Uranie et de la Physicienne, Zool. 1824, p. 329. — Voyage de l'Astrolabe, Poissons, 1834, p. 692.
Pterois zebra Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 367.
Pterois zebra Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 265.
Pterois zebra Günther, Cat. Brit. Mus. II, 1860, p. 126 — Fische der Südsee I, 1873—1875, p. 82.
Pterois zebra Day, Fishes of India, Part I, 1875, p. 153.

Pseudomonopterus (Dendrochirus) zebra Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 50. Atl. Ichth. IX, 1879. Tab. CCCCXI. Fig. 1.
Pterois zebra Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 135.
Pterois volitans M. Weber, Jenaische Denkschr. VIII, 1895, p. 105 (nec L.).
Pterois zebra Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 915.
Dendrochirus zebra Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 294.
Brachirus zebra Whitley, Gr. Barrier Reef Exp. Sci. Rep. IV, No. 9, 1932, p. 306.
Brachirus zebra Matsubara, Trans. Segenkagaku Kenkyusyo 2, 1943, p. 358.
Dendrochirus zebra J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950, p. 374.
Dendrochirus zebra Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 430.
Dendrochirus zebra Munro, The marine and fresh water fishes of Ceylon, 1955, p. 245.

D. XIII. 10 (11). A. III. 6 (7). P. 2. 7. 8 or 2. 8. 7. Sq. l. 50—55. Ltr. $\frac{\genfrac{}{}{0pt}{}{7\text{-}8}{\overline{1}}}{11\text{-}12}$

Height equal to head, 2.4—2.7, 3.2—3.5 in length with caudal. Eye 3.3—3.6, 1—1.2 in snout and more than very concave interorbital space. Mouth oblique. Maxillary reaching to below front-border of eye in large specimens, to below middle of eye in young. Villiform teeth in jaws and on vomer, none on palatines. Occipital region and sides of head covered with cycloid scales, interorbital space and snout naked, but interorbital space covered with very small scales in large specimens. Nostrils close together, the anterior ones with a flap. A pointed spine between them, not developed in young specimens. Preorbital with a series of tentacles, overhanging upper lip. Supraorbital ridge with smaller and larger spines, apparently increasing in number with age. Interorbital space with two low ridges, diverging behind eyes and continued as superior postorbital ridges on occiput, more distinct in young than in old specimens. Superior postorbital ridges with 3 or 4 spines, the anterior one separated from the others, and with another spine below it, between the superior and inferior postorbital ridges. Inferior postorbital ridges with smaller and larger spines, increasing in number with age. Suborbital ridge almost smooth in young, with a great number of spines in old specimens, ending in a small, blunt spine on preopercular edge, which has a few still smaller spines. No distinct suprascapular spine. A poorly developed, flat opercular spine. First dorsal spine as long as snout and eye; 8th dorsal spine longest, slightly longer than base of spinous dorsal, in young specimens slightly shorter. Soft dorsal rounded, its longest rays in length between first and second dorsal spines. First anal spine much shorter than second, third longest, about as long as postorbital part of head. Soft anal rounded, its longest rays slightly longer than those of soft dorsal. Median rays of pectorals deeply forked, upper and lower ones simple, membrane of lower rays only deeply incised. Pectoral reaching on caudal peduncle. Ventrals as long as head. Caudal rounded. Scales of back feebly ctenoid, those of belly cycloid. Colour of preserved specimens light reddish brown, body and tail with broad, darker brown transverse bands, bordered more or less by blackish lines. A silvery white band from eye to posterior part of maxillary, a dark brown band through eye and cheek, another over occiput immediately behind eye, followed by one which runs down along opercle, where it is interrupted by a silvery white blotch. These markings less distinct with age. Vertical fins hyaline, the spines and rays ringed with dark brown, forming rows of spots on the fins. Pectoral membrane very dark brown, rays white, with transverse dark brown bands giving to the fin the appearance of being crossed by light and dark wavy bands. Ventral membranes dark bluish or grey, the rays light, a few rows of small light spots on the membranes near the tip of the fin. Length 200 mm.

Habitat: Sumatra (Priaman, Siboga); Batu Islands; Nias; Java (Banjuwangi!); Bali; Celebes (Makassar, Badjoa, Menado); Timor; Ternate; Buru!; Ceram; Ambon!; Nusa laut!; Banda!; Damar!; Aru Islands; Rawak; Waigeu; New Guinea (Manokwari, southwestern coast!). — Coast of Natal, Madagascar, Mauritius, coasts of India, Andamans, Annam, China, Philippines, Pelew Islands, Guam, Queensland, New South Wales, Lord Howe Island, Gilbert Islands, Fiji, Rotuma, Samoa, Hawaii.

7. **Pterois brachyptera** C. V.

Pterois brachyptera Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 368.
Pterois brachyptera Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 265.
Pterois brachyptera Günther, Cat. Brit. Mus. II, 1860, p. 126.
Pterois brachyptera Playfair, Fishes of Zanzibar, 1866, p. 48.
Pterois brachyptera Klunzinger, Verh. zool. bot. Ges. Wien XX, 1870, p. 808.
Pterois brachyptera Günther, Fische der Südsee I, 1873—1875, p. 82.
Pseudomonopterus (Dendrochirus) brachypterus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 53. — Atl. Ichth. IX, 1879. Tab. CCCCXV. Fig. 3.
Pterois (Dendrochirus) brachyptera Klunzinger, Fische des rothen Meeres I, 1884, p. 73.
Pterois brachyptera Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 914.

Dendrochirus brachyptera Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 295. — Proc. Acad. Nat. Sci. Philadelphia LXXXVI, 1934, p. 485.

Pterois brachyptera Gruvel & Chabanaud, Mém. Inst. d'Egypte XXXV, 1937, p. 25.

Dendrochirus brachypterus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950, p. 374.

Dendrochirus brachypterus Herre, Philipp. Journ. Sci. 80, no. 4, 1952, p. 429.

D. XIII. 9—10. A. III. 5 (6). P. 1. 8. 8. or 1. 9. 7. V. I. 5. Sq. l. 46—49. Ltr. $\begin{array}{c}6\\\hline 1\\\hline 11\text{-}12\end{array}$.

Height 2.3—2.5, 2.9—3.2 in length with caudal. Head 2.6—2.7, 3.4—3.5 in length with caudal. Eye 3.4—3.5, equal to snout and more than very concave interorbital space. Mouth oblique. Maxillary reaching to below middle of eye or not so far. Villiform teeth in jaws and on vomer, none on palatines. Upper part of head, with exception of 3 or 4 rows of small scales before dorsal, and snout, naked. Sides of head covered with cycloid scales. Nostrils close together, the anterior one with a flap. A short spine between them. Preorbital with a few tentacles. Supraorbital with spines, increasing in number with age; it is continued in the inferior postorbital ridge, which has similar spines. Interorbital ridges well developed, nearer together between middle of eyes than before and behind, where it has an erect spine, behind which the ridges are connected by a transverse ridge; they are continued in the superior postorbital ridges which are compressed. Each of these ridges consists of an anterior and a posterior part, separated by an interspace. The anterior part has small spines, increasing in number with age, the posterior part with few, low spines. Suborbital ridge serrated by spines in older specimens, almost smooth in young ones, ending in a rounded spine on preopercular edge which has two more small spines. No suprascapular spine. Opercular spine flat, very poorly developed. First dorsal spine as long as eye and snout, following spines gradually increasing in length to the 5th—8th spines which are subequal and as long as head without snout or a little shorter. Soft dorsal rounded, slightly less deep than spinous dorsal. First anal spine more than half length of second, third spine longest, about equal to eye and snout. Soft anal similar to soft dorsal. Upper pectoral rays deeply forked, with exception of the first one which is simple as are the lower rays. Pectoral reaching to or on caudal peduncle, ventrals somewhat shorter than head. Caudal rounded. Scales of back slightly ctenoid, those of belly cycloid. Colour of preserved specimens yellowish brown with indications of darker transverse bands. Dorsal spines light with dark rings, their membranes, as far as developed dark. Other vertical fins and lower part of pectorals light with narrow dark bands, formed by elongate spots. Upper part of pectorals greyish with about seven broad, dark, transverse bands. Ventrals light greyish with about 4 or 5 broad, dark grey transverse bands, the middle of each band with a transverse row of blackish spots. Length 166 mm.

Habitat: Nias; Bali!; Celebes (Amurang); Solor; Buru; Ceram; Ambon!; New Guinea. — Coasts of Natal, Zanzibar, Red Sea, Suez Canal, Philippines, Fiji, Samoa, Tongatabu, Hawaii.

8. **Pterois biocellata** (Fowler)

Nemapterois biocellata Fowler, Proc. U. S. Nat. Mus. LXXXV, 1938, p. 81. — Monogr. Acad. Nat. Sci. Philadelphia II, 1938, p. 106.
Nemapterois biocellatus Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 435.

D. XIII. 9. A. III. 5. P. 2. 7. 9. V. I. 5. Sq. l. 43. Ltr. $\begin{array}{c}6\\ \hline 1\\ \hline 14\end{array}$.

Height 2.75, head 2.4. Snout 3.25 in head. Eye 3, more than twice width of interorbital space. Mouth oblique. Maxillary reaching to below anterior part of eye. Villiform teeth in the jaws and on vomer, none on palatines. Upper part of head scaly, excepting snout and anterior half of interorbital space. Sides of head scaly. Anterior nostril with a pointed, fringed tentacle. A short lobate supraorbital flap behind second spine of supraorbital ridge. A broad flap above uppermost preopercular spine and several others below along preopercular edge. A short preorbital flap anteriorly, followed by a long tentacle reaching back opposite pectoral origin. No nasal spine. Superior postorbital ridge with several spines. Suborbital ridge without spines. Preopercular edge with 3 spines, upper largest and opposite end of suborbital ridge. Opercle with one rather large spine. No humeral spine. First dorsal spine about as long as snout, following spines gently increasing in length to sixth, which is about as long as head without snout. Greater terminal part of dorsal spines free. Soft dorsal rounded, longest ray about equal in length to fourth dorsal spine. First anal spine shorter than second, third longest and about as long as 7th dorsal spine. Upper rays of pectoral branched, excepting the two uppermost ones which are simple as the lower rays; pectoral membrane well developed and only slightly incised. Pectorals reaching to below beginning of soft dorsal. Ventrals somewhat shorter than head. Caudal rounded. Scales ctenoid. General tint flesh colour to light pink. Brown blotch on front of snout, followed by broad white band from front of eye down to maxillary. Brown bar down from eye to end of maxillary. Two dark brown bands cross postocular part of head. A short but broad band below anterior dorsal spines, another, down to belly, below middle of spinous dorsal and still another from beginning of soft dorsal to anal. Spinous dorsal white with 3 longitudinal dark brown bands, with upper two marked as dark bars on free portion of spines. Lowest band connected with band on body median dorsal spines, which is continued upwards on the fin. Two large black, white edged ocelli on outer part of soft dorsal. Anal blackish brown with median white band. Caudal white, with dark transverse basal band and 5 transverse dark narrow bands, made up of spots only on rays. Pectorals white, with 4 black transverse bands. Ventrals black, edged with white and with some white spots in posterior part of fin. Length 140 mm (after Fowler, not seen by me).

Habitat: Sulu Islands. — Tuamotu Islands.

8. **Parapterois** Bleeker

(Bleeker, Versl. Akad. Amsterdam (2) IX, 1876, p. 296)

Parabrachiurus Matsubara, Sigenkagaku Kenkyusyo 2, 1943, p. 346.

Oblong, rather compressed. Body, tail, sides of head, and crown of head to middle of interorbital space covered by ctenoid scales. Bony ridges of head covered with smaller and stouter spines. Villiform teeth in jaws and on vomer, none on palatines. Dorsal consisting of XIII spines and 9 soft rays. Basal part of dorsal

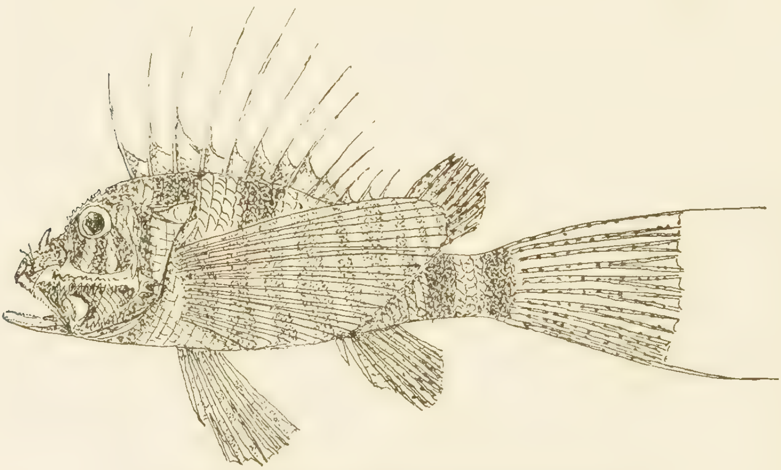

Fig. 9. *Parapterois heterurus* Blkr. After Bleeker.

spines only connected by membrane. Anal with II spines and 6—7 rays. Pectorals long, reaching to base of caudal, with 18 rays, the median ones forked. Pectoral membranes not incised. Ventrals with a spine and 5 rays. Caudal truncate, the outer upper and lower rays prolonged and filamentous.

Distribution: Indo-Pacific.

1. **Parapterois heterurus** (Blkr.) (Fig. 9, p. 52)

Pterois heterurus Bleeker, Acta Soc. Indo-Neerl. I, 1856. Beschr. vischs. Amboina, p. 33.
Pterois heterura Günther, Cat. Brit. Mus. II, 1860, p. 127.
Pseudomonopterus heterurus Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 285.
Parapterois heterurus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 55. Atl. Ichth. IX, 1879. Tab. CCCCXV. Fig. 6.
Pterois macrura Alcock, Journ. Asiat. Soc. Bengal LXV, 1896, p. 303. — Descr. Cat. Indian Deep-Sea Fishes, 1899, p 30.
Pterois jordani Regan, Ann. Mag. Nat. Hist. (7) XV, 1905, p. 20.
Pterois heterura Fowler & Bean, Proc. U.S. Nat. Mus. 62, 1922, Art. 2, p. 62.
Parapterois heterurus Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 433.
Parabrachiurus heterurus Matsubara, Sigenkagaku Kenkyusyo 2, 1943, p. 348.

D. XIII. 9. A. II. 7 (8). P. 1. 9. 8. V. I. 5. Ll. 36—40. Ltr $\begin{array}{c} 4 \\ \hline 1 \\ \hline 11 \end{array}$.

Height 3. Head 2.6. Eye 3.4, 1.5 in snout. Interorbital space very concave, about 1.4 in eye. Mouth oblique. Maxillary reaching about to below middle of eye. Villiform teeth in jaws and on vomer, Preorbital, supraorbital ridge, and suborbital ridge with many crowded shorter and longer pointed or blunt spines. A group of longer spines at preopercular angle. Sides of head scaly. Crown of head scaly, the scales reaching in a triangular patch to the middle of the interorbital space. Origin of dorsal slightly behind the hindborder of the preopercle. First dorsal spine equal to eye and snout, the following spines much longer, but broken in the specimen examined. First anal spine slightly less than one third of second spine which is about equal to snout. Pectorals reaching to base of caudal, ventrals to middle of anal. Caudal broken in the type specimen examined, but according to Bleeker the fin is truncate and with the upper and lower outer rays prolonged into filaments. Colour of specimen examined faded, but according to authors there are on the cheeks three dark vertical bands. Body and tail with dark vertical bands. Pectorals and ventrals dark, the former with 8—10 light vertical bands. Length with caudal filaments 175 mm (description made after the type specimen in the Leiden Museum, 80 mm long without caudal).

Habitat: Ambon! — Off Malabar coast, Formosa, Japan.

9. **Pteroidichthys** Bleeker

(Bleeker, Acta Soc. Sci. Indo-Neerl. I, 1856. Beschr. vischs. Amboina, p. 33.

Much compressed. Body and tail covered with rather small cycloid scales. Head naked, but provided with cirri. No distinct spines on head, excepting those on opercle and preopercle. Villiform teeth in jaws, and on vomer in a transverse, bent, narrow patch. Origin of dorsal above opercle. Dorsal consisting of XI flexible spines and 11 simple rays. A deep notch between spinous and soft part of dorsal. Membranes between dorsal spines reaching to tip of spines. Anal with II flexible spines and 7 simple rays. Pectorals with 15 simple rays. Ventrals with a spine and 5 forked rays. Caudal rounded with all the rays simple.

Distribution that of the single species known.

1. **Pteroidichthys amboinensis** Blkr (Fig. 10, p. 54)

Pteroidichthys amboinensis Bleeker, Acta Soc. Sci. Indo-Neerl. I, 1856. Beschr. vischs. Amboina, p. 34. — Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 57. — Atl. Ichth. IX, 1879, Tab. CCCCXIV. Fig. 1.

Pteroidichthys amboinensis Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 436.

D. XI. 11. A. II. 7. P. 15. V. I. 5. Ll. 40. Ltr. $\begin{array}{c}5\text{-}6\\ \hline 1\\ \hline 16\end{array}$.

Height 2.9, 4 in length with caudal. Head 2.4, 4.4 in length with caudal. Eye 5.3, 1.6 in snout. Interorbital space concave, about 1.3 in eye. Mouth oblique. Maxillary reaching to below anterior half of eye. Eyes much prominent above upper profile of head, the supra-

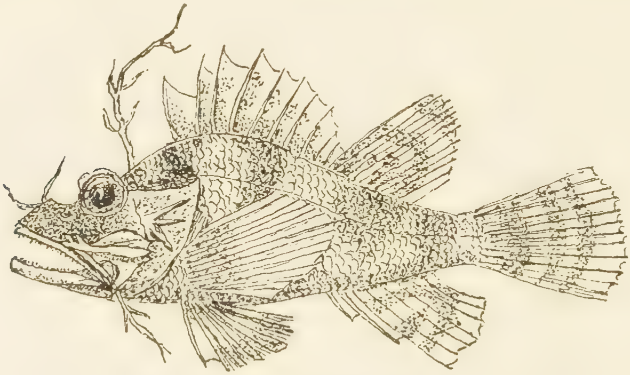

Fig. 10. *Pteroidichthys amboinensis* Blkr. After Bleeker.

orbital ridges expanded laterally above the eyes and each provided with a long arborescent tentacle. Tentacles on snout and on lower jaw. Superior and inferior postorbital ridges crenulated. Suborbital ridge rough but without spines. Origin of dorsal behind hindborder of preopercle. First spine as long as snout. Fourth dorsal spine longest and equal to snout and eye. Dorsal rays all simple, annulated, the longest half length of snout less than head. First anal spine about equal to eye, second anal spine about as long as snout. Both spines flexible. Anal rays all simple, annulated. Pectorals with all rays simple, almost as long as head, and reaching on anal. Ventrals with all the rays forked, half length of snout less than head. Caudal with all rays simple, rounded. Coloration of type specimen examined now faded but according to Bleeker back, tail, and unpaired fins with dark blotches or bands. Length 82 mm.

Habitat: Celebes (Menado!); Ambon!

10. **Apistus** Cuvier

(Cuvier, Règne Animal, Ed. II, Vol. II, 1829, p. 167)

Prosopodasys Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850, p. 1026.

Moderately compressed. Body and tail covered with small cycloid scales. Head naked, pointed. Upper part of head with bony ridges which are not spinous. Preorbital with one long spine directed backwards and two small anterior spines directed forwards. Suborbital ridge without spines. Mouth large. A long posterior and a short anterior barbel on lower jaw. Narrow bands of villiform teeth in jaws, on vomer, and palatines. Preopecle with a long and strong spine, in continuation of the suborbital ridge. Opercle with two ridges, ending in spines. Origin of dorsal above hinder part of opercle. Dorsal with XV spines and 8—9 rays. Anal with III spines and 7—8 rays. Last dorsal and anal rays not connected with caudal peduncle. Greater part of dorsal, anal, and pectoral rays, forked. Pectorals inferiorly with one free rod-like flexible ray. Ventrals with a strong spine and 5 rays. Gill membranes free from isthmus. Branchiostegals 7. A cleft behind the fourth gill.

Distribution: A few species in the Indo-West Pacific.

1. **Apistus carinatus** (Bl. Schn.) (Fig. 11, p. 57)

Scorpaena carinata Bloch, Schneider, Syst. Ichth. 1801, p. 193.
Apistus alatus Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 392.
Apistus Israelitarum Cuvier & Valenciennes, ibid. p. 397.
Apistus alatus Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 174.
Apistus alatus Günther, Cat. Brit. Mus. II, 1860, p. 131.

Apistus israëlitarum Klunzinger, Verh. zool. bot. Ges. Wien XX, 1870, p. 809.
Apistus carinatus Day, Fishes of India, Part I, 1875, p. 155.
Apistus alatus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 59. — Atl. Ichth. IX, 1879. Tab. CCCCXII. Fig. 6.
Apistus alatus Klunzinger, Fische des rothen Meeres I, 1884, p. 73.
Apistus alatus Rutter, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 81.
Apistus evolans Jordan & Starks, Proc. U. S. Nat. Mus. XXVII, 1913, p. 146.
Apistus venerans Jordan & Starks, ibid. p. 148.
Apistus carinatus McCulloch, Biol. Res. Endaveour III, 1915, p. 160.
Apistus carinatus Fowler & Bean, Proc. U. S. Nat. Mus. LXII, 1922, Art. 2, p. 63.
Hypodytes carinatus McCulloch, Mem. Austr. Mus. V, 1929, p. 389.
Apistus carinatus Matsubara, Trans. Segenkagaku Kenkyusyo 2, 1943, p. 396.
Apistus carinatus Blegvad, Danish Inv. Iran, Part III, 1944, p. 190.
Apistus alatus Boeseman, Rev. Fishes Coll. Burger and von Siebold, Japan. 1947, p. 58.
Apistus carinatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950, p. 374.
Apistus alatus Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 442.

D. XV. 8—9 (10). or XV. 1. 8 (9). A. III. 7—8. P. 1. 9. 1 + 1 or 6. 4 + 1. V. I. 5. Ll. about 55. Ltr. $\begin{array}{c}7\\\hline 1\\\hline 15\end{array}$.

Height 3—3.7, 4.2—4.5 in length with caudal. Head 2.3—2.9, 3—4.3 in length with caudal. Eye 3.9—5, 1—1.6 in snout. Interorbital space concave, 1.1—2.2 in eye. Two bony ridges, close together and parallel to each other on interorbital space, slightly diverging on occiput. Preorbital with two small spines directed downwards and somewhat forwards, and a strong sword-like spine, directed backwards and reaching to below middle of eye. Hindborder of preopercle with a strong, short spine, and a shorter one below it. Two divergent ridges on opercle, each ending in a spine. A long slender tentacle on chin at symphysis of lower jaw, and a similar tentacle on middle of each lower jaw. About 4 rows of scales before dorsal. Origin of dorsal above posterior half of opercle. First dorsal spine slightly shorter than second. Spines increasing in length to the fourth which equals snout and eye. Fourth to eleventh spines subequal. Twelfth to fourteenth spines decreasing in length, the fourteenth shorter than the first spine. Fifteenth spine again as long as fourth spine, or between second and third spine in length. Dorsal rays forked. Anal spines increasing in length from first to third which is slightly shorter or longer than first dorsal spine. Anal rays forked. Pectorals much pointed, the superior rays longest and reaching to posterior half of soft anal or beyond. Detached pectoral ray as long as head without snout, or half length of snout longer, and about as long as pointed ventrals. Caudal slightly rounded. Body totally covered with small scales which are three- or four-lobed along their hindborder, each lobe with a median ridge and ending in a point. Colour of preserved specimens brownish above, silvery below. Spinous dorsal whitish with a black spot between first and second spines and an ovate, black, white edged ocellus between the 9th—12th spines. Base of soft dorsal more or less blackish, the rays ringed white and brown. Anal, pectorals, and ventrals dark brown or anal light with a dark oblique band and ventrals yellowish. Caudal rays ringed white and brown, black subterminally. Length 165 mm.

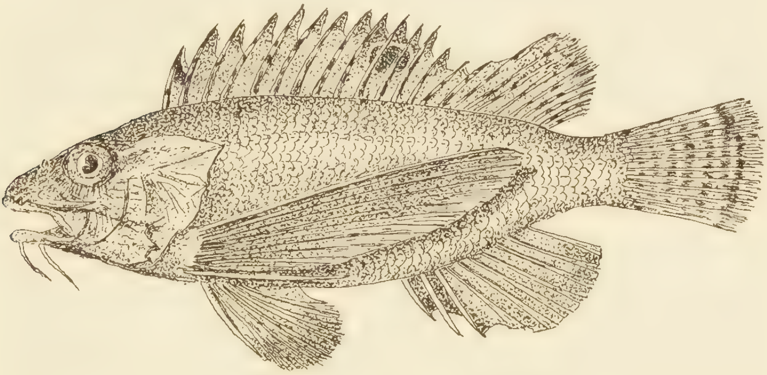

Fig. 11. *Apistus carinatus* (Bl. Schn.) after McCulloch. × 5/8 nat. size.

Habitat: Java (Jakarta!); New Guinea (Merauke!) — Red Sea, Arabian Sea, Gulf of Iran, coasts of India, Formosa, China, Japan, Philippines, coast of Queensland.

11. **Taenianotus** Lacepède

(Lacepède, Hist. Nat. Poissons IV, 1802, p. 303)

Much compressed, back elevated. Body covered with small rudimentary scales, imbedded in the skin, each scale with a minute spine posteriorly. Head scaleless. Ridges and spines on head rudimentary. Teeth villiform, very small in jaws and on vomer, none on palatines. Origin of dorsal above hindborder of eye. Dorsal with XII spines and 11 rays. Anal with III spines and 7 rays. All pectoral rays simple but articulated. Gill opening wide. Gill membranes anteriorly attached to isthmus. No cleft behind the last gill arch. Dorsal and caudal connected by membrane.

Distribution that of the single species known.

1. **Taenianotus triacanthus** Lac. (Fig. 12 p. 58)

Taenianotus triacanthus Lacepède, Hist. Nat. Poissons IV, 1802, p. 303, p. 306.
Taenianotus triacanthus Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 371.
Taenianotus triacanthus Bleeker, Nat. Tijdschr. Ned. Indië VIII, 1855, p. 411.
Taenianotus triacanthus Günther, Fische der Südsee I, 1873—1875, p. 83.
Taenianotus triacanthus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 82. — Atl. Ichth. IX, 1879. Tab. CCCCXVII. Fig. 1.
Taenianotus citrinellus Gilbert, Bull. U. S. Fish. Comm. XXIII, Part II (1903) 1905, p. 636.
Taenianotus triacanthus M. Weber, Siboga Exp. Fische, 1913, p. 503.
Taenianotus triacanthus Schultz, Copeia 1938, No. 4.
Taenianotus triacanthus Randall, Atoll Res. Bull. 47. 1955, p. 202.

D. XII. 11. A. III. 7. P. 14. V. I. 5. Ll (tubes). 23.

Height 2, 2.5 in length with caudal. Head 2.3, 2.9 in length with caudal. Eye 2.5, 4 in snout. The eyes close together. Mouth very oblique, lower jaw somewhat prominent. Maxillary reaching to below hindborder of pupil. Anterior nostril with a cutaneous flap. A similar but longer flap above eye. A spine above hinder part of eye and another behind it, in front of the origin of the dorsal. A very feeble, blunt preorbital spine, directed downward. Suborbital ridge feeble, with indications of spines only. Two very feeble, blunt spines along hindborder of preopercle. Upper part of opercle with two ridges, ending in small but pointed spines. Origin of dorsal

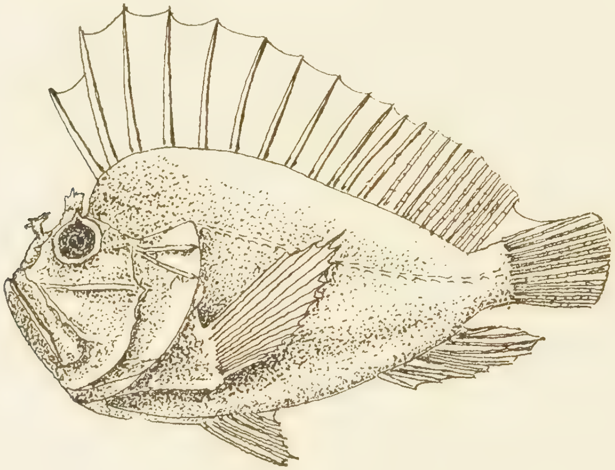

Fig. 12. *Taenianotus triacanthus* Lac. × 2.

above hinder part of eye. First spine more than half as long as second which is subequal to third. Third spine as long as the distance between tip of snout and hindborder of preopercle. Following spines decreasing somewhat in length, the last equal to snout and eye. Dorsal rays simple but articulated, the longest slightly longer than last dorsal spine. Anal spines somewhat curved, the first half as long as second which is about two thirds of third spine. Third spine as long as last dorsal spine. Soft anal pointed, the post-median rays longest, and as long as longest dorsal rays. Pectorals about as long as head; ventrals as long as head without snout. Caudal truncate. Colour of preserved specimen described yellowish, fins hyaline, the caudal with some brown markings. Length of specimen described 43 mm. The species can attain a length of over 100 mm.

Habitat: Talaut Islands!; Ambon. — Mozambique Chagos Archipelago, Solomon Islands, Marshall Islands, Gilbert Islands. Fiji, Samoa, Phoenix Islands, Society Islands, Hawaii, Tuamotu Archipelago.

Note. The colour of this rare species is very variable, according to Schultz l.c. It may be dark brown, reddish, or yellow and it seems to have the ability to change colour rapidly. According to Mr. Degener's notes, quoted by Schultz: "even in aquariums it will slowly oscillate from side to side as though it were a piece of seaweed swayed by ocean current. When fed with live shrimp, for example, it will by swaying gradually maneuver into position and then suddenly swallow victim".

12. **Erisphex** Jordan & Starks

(Jordan & Starks, Proc. U. S. Nat. Mus. XXVII, 1903, p. 169)

Compressed. Head and body without scales, but body covered with velvety frickles. Upper part of head without spiny ridges. Preorbital with a short anterior and a longer posterior spine. Villiform teeth in jaws and on vomer, none on palatines. Preopecle with 4 or 5

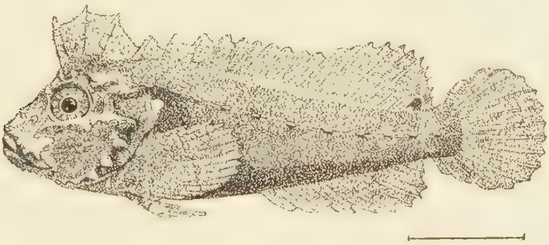

Fig. 13. *Erisphex obbesi* (M. Weber). × 1½.

spines, the uppermost the largest. Origin of dorsal above eye. Dorsal consisting of XI—XV spines and 8—13 rays. Anal with II—III spines and 7—11 rays. Last dorsal and anal rays connected with caudal peduncle. All dorsal and anal rays simple, those of anal not articulated and hence difficult to distinguish from the anal spines which are weak. Pectoral rays simple. Ventrals with one spine and 2—3 rays. Gill membranes free from isthmus. Five branchiostegals.

Distribution. From the Seychelles to the Indo-Australian Archipelago and Japan.

Key to the Indo-Australian species of Erisphex

a. Origin of dorsal above middle of eye. D. XI.
13 or XII. 12. A. II. 10—11. . . . . 1. *E. potti* p. 60.
b. Origin of dorsal above frontborder of eye. D.
XII. 9 (10). A. III. 8. . . . . 2. *E. dermacanthus* p. 61.
c. Origin of dorsal above hinder part of eye. D.
XIII. 11. A. II. 8. . . . . 3. *E. obbesi* p. 62.

1. **Erisphex potti** (Steind.)

Cocotropus pottii Steindachner, Ann. Hofmus. Wien XI. Heft 2, 1896, p. 203.
Cocotropus pottii Waite, Rec. Austr. Mus. V, 1903, p. 44.
Erisphex pottii Jordan & Starks, Proc. U. S. Nat. Mus. XXVII, 1903, p. 170.
Erisphex pottii Franz, Abh. K. Bayer. Acad. IV. Suppl. Bd. 1, 1910, p. 74.
Erisphex potti Matsubara, Trans. Segenkagaku Kenkyusyo 2. 1943, p. 460.

D. XI. 13 or XII. 12. A. II. 10—11. P. 12. V. I. 2.

Height $2^{5}/_{6}$, about $3^{1}/_{2}$ in total length. Head $3^{1}/_{2}$, about 4 in total length. Eye 4, snout 3, slightly concave interorbital space 5 in head. Mouth very oblique, more nearly vertical than horizontal. Maxillary reaching to below middle of eye. Teeth in several rows in jaws and on vomer, none on palatines. A high median interorbital ridge divides anteriorly and surrounds a pit behind premaxillary process, posteriorly it stops at a slight transverse depression just in front of dorsal. Preorbital with three spines, the anterior one minute, the posterior one almost as long as eye, and directed backwards and downwards. Preopercle with 4 spines, the upper one the largest. A blunt spine at upper posterior edge of eye, another behind it opposite base of third dorsal spine; two similar ones behind eye on a level with origin of lateral line. Suborbital ridge spineless. Origin of dorsal a little behind middle of eye. Anterior three dorsal spines subequal, more than twice in head. Following spines and rays subequal and shorter, last ray connected by membrane with caudal peduncle. Anal a little lower than dorsal. Pectorals reaching to front of anal or a little past. Ventrals as long as snout and eye.

Caudal rounded. Colour of preserved specimens uniform brownish, belly lighter with more or less distinct spots on back and sides. Tips of pectoral and caudal rays white. Head and body, base of pectorals, and base of dorsal and anal covered with soft hair-like papillae. Length 103 mm (Compiled, not seen by me).

Habitat: Celebes-Japan.

Note. Steindachner l.c. mentions a specimen in the Vienna Museum of this Japanese species from Celebes. As it has never been found again outside Japan and Korea, the habitat Celebes is open to doubt.

2. **Erisphex dermacanthus** (Blkr.)

Apistus dermacanthus Bleeker, Nat. Tijdsch. Ned. Indië III, 1852, p. 268.
Aploactis dermacanthus Bleeker, Acta Soc. Indo-Neerl. VI, 1859. Enum. pisc., p. 44.
Tetraroge dermacanthus Günther, Cat. Brit. Mus. II, 1860, p. 136.
Cocotropus dermacanthus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 92. — Atl. Ichth. IX, 1879. Tab. CCCCXI. Fig. 2.
Cocotropus dermacanthus Waite, Rec. Austr. Mus. V, 1903, p. 43.
Coccotropus dermacanthus M. Weber, Siboga Exp., Fische, 1913, p. 503.
Cocotropus dermacanthus Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 463.

D. XII. 9 (10). A. III. 8. P. 13. V. I. 3.

Height 2.6, 3 in length with caudal. Head 2.75, 3.55 in length with caudal. Eye 3.7, about equal to very convex interorbital space. Snout shorter than eye. Mouth very oblique. Maxillary reaching to below middle of eye. Villiform teeth in jaws and on vomer, none on palatines. Preorbital with two small spines, the posterior one slightly the longer. Hindborder of preopercle with five spines, decreasing in size downwards. Origin of dorsal above frontborder of eye, the first spine strongest and as long as second, equal to distance between tip of snout and hindborder of preopecle. Third spine about equal to postorbital part of head, slightly longer than following spines which are subequal. Dorsal rays simple and articulated, the longest as long as first dorsal spine. Third anal spine longest, about as long as eye. Anal lower than soft dorsal, the rays simple and articulated. Pectorals slightly shorter than head, all rays simple and articulated. Second ventral ray longest, equal to postorbital part of head. Caudal rounded. Head covered with small round wattles, the pores of the sensory canals very conspicuous. Body and tail with smaller and more distant wattles. Lateral line with about 7 elongate tubes in anterior part of body, indistinct on tail. Colour of preserved specimen light pinkish, bright pink along base of dorsal. Head with numerous brown spots; similar but more elongate and more distant ones on body and tail. A light, dark edged, double ocellus below fifth to seventh dorsal spines, a similar white ocellus immediately above it on dorsal which otherwise is obliquely striped, specially in its upper part. A small white ocellus on last dorsal spine. Anterior and superior border of dorsal bright pink. A very small ocellus below anterior part of soft dorsal. Anal with a broad, brownish terminal band, posteriorly with some small white spots or ocelli. Pectorals variegated with brown, bright pink at their base and distally. Ventrals variegated with brown. Caudal spotted with brown and with bright pink blotches. Description made after a specimen of 35.5 mm. The type is 55 m long.

Habitat: Sulu Islands!; Ceram. — Seychelles.

3. **Erisphex obbesi** (M. Weber) (Fig. 13, p. 59)

Coccotropus Obbesi M. Weber, Siboga Exp. Fische, 1913, p. 503.
Membracidichthys obbesi Whitley, Rec. Austr. Mus. XIX, 1933, p. 102.
Coccotropus obbesi Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 463.

D. XIII. 11. A. II. 8. P. 13. V. I. 3.

Height 3.1, 3.8 in length with caudal. Head 2.8, 3.4 in length with caudal. Eye 4.8, 1.3 in snout and in convex interorbital space. Mouth somewhat oblique. Maxillary reaching to below frontborder of eye. Villiform teeth in the jaws, none visible on vomer and palatines. A deep pit in interorbital space, bordered by two spineless ridges and a transverse ridge behind. Preorbital with three short spines. Suborbital ridge with a single blunt spine. Hindborder of preopercle with five spines, the uppermost the largest. Origin of dorsal above hinder part of eye. First dorsal spine as long as eye and subequal to third; second spine longest and equal to postorbital part of head. These three spines form a distinct portion of the dorsal fin, the membrane between the third and fourth spines being very low. Fourth and following spines much shorter than the anterior ones. Longest dorsal ray longer than dorsal spines, equal to snout and eye. First anal spine shorter than second which again is shorter than first anal ray; fifth anal ray longest, equal to postorbital part of head. Pectorals slightly longer than head without snout. Ventrals equal to postorbital part of head. Caudal rounded. Lateral line with 11 elongate tubbes. Head, including the spines, body, and fins covered with small fleshy warts. Colour of preserved specimen dull pinkish, fins hyaline, a brown spot on base of last dorsal ray. Length 50 mm.

Habitat: North Ubian, Sulu Archipelago, 16—23 m!

Note. The specimen described is the type and the only specimen known.

13. **Scorpaenella** Fowler

(Fowler, Proc. U. S. Nat. Mus. LXXXV, 1938, p. 83)

Body deeply ovoid, compressed. Head compressed, with spiny ridges. Head, body and tail scaleless. Skin smooth. Teeth minute, villiform, in narrow bands in jaws, apparently present on vomer, but none on palatines. Origin of dorsal above posterior part of opercle. Dorsal with X spines and 9 rays. Anal with III spines and 5 rays. Pectorals large, with broad base, all rays simple. Ventrals with a long spine and 5 rays. Gill openings wide, membranes free and separate.

Distribution that of the single species known.

1. **Scorpaenella cypho** Fowler (Fig. 14, p. 63)

Scorpaenella cypho Fowler, Proc. U. S. Nat. Mus. LXXXV, 1938, p. 84.
Scorpaenella cypho Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 443.

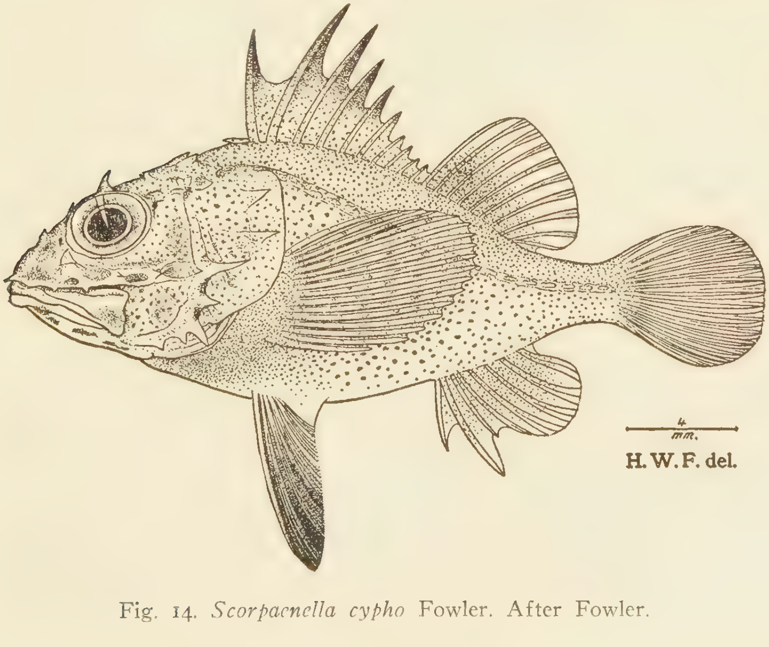

Fig. 14. *Scorpaenella cypho* Fowler. After Fowler.

D. X. 9. A. III. 5. P. 17? V. I. 5.

Height 2.4. Head 2.35. Eye 4, equal to snout, greater than level interorbital space. Maxillary reaching to below middle of eye. Gill rakers 3 + 10, rather small. A pair of small nasal spines. A very small and low antero-supraorbital spine; a large, high, prominent medio-supraorbital spine; a pair of very small postero-supraorbital spines; occipital-nuchal keel ends behind in a single pair of spines; 3 divergent preorbital spines each side, anterior largest and directed forward; suborbital stay with 3 low spines; preopercular spines 5, upper largest or 1.6 in eye; a single postocular spine and one at suprascapula; two rather widely divergent opercular spines, lower little posterior. Pores lateral line 21 (last part of course damaged) in mebranous canal extending whole course. No filaments or flaps. Third dorsal spine twice in head, first branched ray thrice, pectorals 1.3, ventrals 1.8. Largely uniform brown, with obscure darker specks or spots on trunk and tail. Fins pale. Ventrals rays darker terminally. Length of single specimen known 27 mm (after Fowler, not seen by me).

Habitat: Molucca Passage, 750 m.

Note. Fowler says that this species is suggestive of *Lythrichthys* and *Pteroidichthys,* but lacking scales. As far as can be judged from the description and the figure, it also shows some resemblance with *Minous,* specially in the ventral fin being apparently adnate to the belly. It differs however, in having branched rays in the dorsal and anal, in the lack of a free pectoral ray, and in the presence of three well developed anal spines. It seems therefore right to keep the genus *Scorpaenella* in the Scorpaenidae. It is, however, not impossible that the small specimen described is the young of some other species of a known genus.

14. **Gymnapistus** Swainson

(Swainson, Nat. Hist. of Fishes etc. II, 1839, p. 265)

Pentaroge Günther, Cat. Brit. Mus. II, 1860, p. 132.

Compressed. Head and body without any scales. Ridges on head low and smooth. A short spine above posterior nostril. Preorbital spine long and dagger-shaped. Villiform bands of teeth in the jaws, on vomer and on palatines. Suborbital ridge without spines. A rather strong spine at preopercular edge, with three very small ones below it. Opercle with two flat spines. Origin of dorsal on the neck, well behind eye. Dorsal with XI or XII spines and 9—10 rays. Anal with III spines and 6 rays. Last dorsal and anal rays connected with caudal peduncle. Dorsal, anal, and pectoral rays forked. Ventrals with a spine and 5 forked rays. Gill membranes free from isthmus. A cleft behind the fourth gill.

Distribution that of the single species known.

1. **Gymnapistus marmoratus** (C. V.) (Fig. 15, p. 66)

Apistus marmoratus Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 416.

Apistes marmoratus Richardson, Proc. Zool. Soc. London VII, 1839, p. 97. — Transact. Zool. Soc. London III, part 1. 1849, p. 99.

Apistus Jenynsii Bleeker, Verh. Akad. Amsterdam II, 1855. Visschen van Diemensland, p. 8.

Pentaroge marmorata Günther, Cat. Brit. Mus. II, 1860, p. 132.

Pentaroge marmorata Steindachner, Sitzber. Akad. Wien LVII, 1868, p. 984.

Gymnnapistus marmoratus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876 Mém. Scorpénoides, p. 87.

Pentaroge marmorata Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 139.

Pentaroge marmorata Johnston, Roy. Soc. Tasmania, 1882, p. 115.

Pentaroge marmorata Waite, Rec. Austr. Mus. VI, 1906, p. 201.

Pentaroge marmorata McCulloch, Biol. Res. Endaveour III, 1915, p. 161.

Gymnapistus marmoratus Waite, Rec. South Austr. Mus. II, No. 1, 1921, p. 166.

D. XIII. 1. 9. A. III. 6. P. 1. 10. V. I. 5.

Height 2.7—3, 3.5—3.7 in length with caudal. Head 2.46—2.53, 3.17—3.19 in length with caudal. Eye 4—4.37, as long as snout. Interorbital space somewhat concave, 1.25—1.4 in eye. Mouth somewhat oblique. Maxillary reaching to below frontborder of pupil or to below middle of eye. Villiform teeth in jaws, on a triangular patch on vomer and in oval bands on palatines. No barbels. Anterior and posterior nostrils with short tubes, a pore between them. Two minute spines between posterior nostrils. Preorbital with two spines, a small anterior one, directed downward and somewhat backward, and a very long dagger-like one, pointing backward and reaching beyond hindborder of eye. A slightly shorter one, as long as eye, on preopercular border at end of suborbital ridge, followed by 3 or 4 small ones below it. No opercular spines. Origin of dorsal above hindborder of preopercle. First dorsal spine somewhat more than eye, four sevenths or five eighths of second which is slightly shorter than postorbital part of head. Third spine longest, equal to postorbital part of head and half eye; last spine slightly more than eye. Soft dorsal rounded, longest ray somewhat shorter than postorbital part of head, last ray connected by membrane to caudal peduncle.

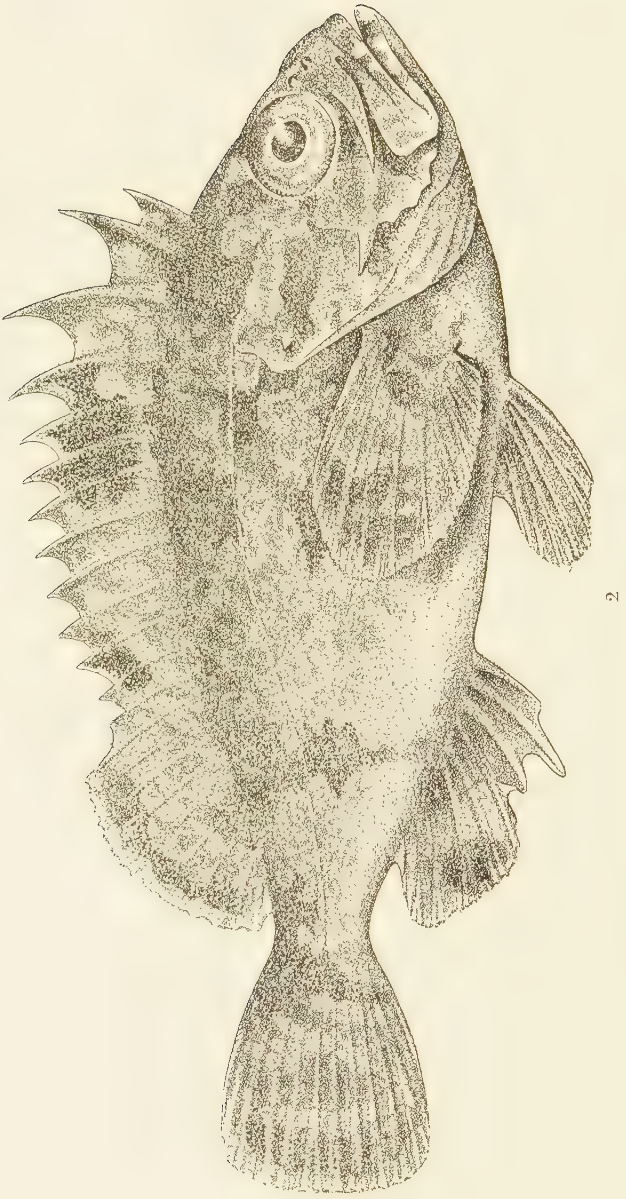

Fig. 15. *Gymnapistus marmoratus* (C. V.). After McCulloch.

First anal spine equal to eye, second as long as snout and eye, third slightly shorter than second. Soft anal slightly rounded, almost truncate, last ray connected by membrane to caudal peduncle. All anal rays forked, the longest as long as second anal spine. Pectorals rounded, half length of snout shorter than head. Ventral spine as long as postorbital part of head, second ray half eye longer, last ray broadly connected by membrane to belly. Caudal slightly rounded. Colour of preserved specimen buff. Head, body, and tail marmorated with larger and smaller dark brown to light brown, irregularly shaped blotches which are more or less distinctly bordered by narrow lines of white. A dark blotch below eye, another on occiput and anterior part of dorsal. Another on back and sides below middle of spinous dorsal and also one along base of soft dorsal. Lastnamed blotch has a triangular part posteriorly, the point of which directed to and expanding on anal. Breast and belly without spots. Soft dorsal with a terminal dark, longitudinal band. A subterminal band on three anterior anal rays. Pectorals and caudal with broad, dark, basal and terminal cross bands. Ventrals with faint dusky band. Description made after the two typical specimens in the Paris Museum, 127 and 150 mm long.

Habitat: Timor! — Australia, Tasmania. In sea.

15. **Tetraroge** Günther

(Günther, Cat. Brit. Mus. II, 1860, p. 132)

Moderately compressed. Head and body naked, sometimes covered with minute rounded papillae. Upper part of head with or without bony ridges, but without spines. Villiform bands of teeth in jaws, vomer, and palatines. Hindborder of preopercle with a strong spine. Opercle with two or three weak spines. Origin of dorsal above eye. Dorsal with XIII spines and 7—8 rays. Anal with III spines and

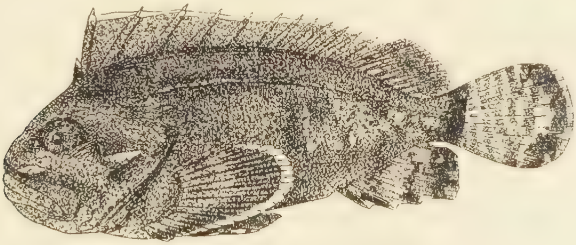

Fig. 16. *Tetraroge niger* (C. V.). nat. size.

5—6 rays. Last dorsal and anal rays connected with caudal peduncle. Dorsal, anal, and pectoral rays forked. Ventrals with a spine and five forked rays. Gill membranes free from isthmus. Branchiostegals 7. No cleft behind the fourth gill.

Distribution: Indic and West Pacific.

Key to the Indo-Australian species of Tetraroge

A. A pair of barbels on symphysis of lower jaw. . 1. *T. barbata* p. 68.
B. No barbels on lower jaw.
  a. A deep groove on both sides of origin of dorsal above hinderpart of eye . . . . . 2. *T. leucogaster* p. 69.
  b. No such grooves . . . . 3. *T. niger* p. 70.

1. **Tetraroge barbata** (C. V.)

Apistus barbatus Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 413.
Apistus melas Bleeker, Nat. Tijdschr. Ned. Indië I, 1850, p. 26.
Apistus barbatus Bleeker, Acta Soc. Indo-Neerl. I, 1856. Beschr. vischs. Amboina, p. 36.
Tetraroge barbata Günther, Cat. Brit. Mus. II, 1860, p. 133.
Gymnapistus barbatus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 85. Atl. Ichth. IX, 1879. Tab. CCCCXVII. Fig. 3.
Tetraroge barbata Herre, Notes Fish. Zool. Mus. Stanf. Univ. 1934, p. 65.
?*Tetraroge albifrons* Duncker & Mohr, Mit. Zool. Mus. Hamburg XLIV, 1929, p. 70 (pro parte).
Tetraroge barbata Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 454.

D. XIII. 7—8. A. III. 5. P. 12. V. I. 5.

Height 2.5—2.8, 3.2—3.6 in length with caudal. Head 2.5—2.6, 3.3—3.4 in length with caudal. Eye 3.1—5, equal to snout. Interorbital space flat, slightly less than eye. Mouth oblique. Maxillary reaching to below hindborder of pupil. Two small barbels at symphysis of lower jaw. Villiform bands of teeth in jaws, on vomer, and on palatines. Preorbital with a small, blunt spine which carries a short tentacle, and a longer dagger-like spine directed backwards, reaching as far back as maxillary or somewhat further. Hindborder of preopercle with a strong spine and some rudimentary spines below it. Opercle with two flat spines. Origin of dorsal above middle of eye. First dorsal spine about one fourth of second which is slightly longer than third and more than half length of head. Fourth spine shorter than third, about half length of second; these spines diverging and more separated than the others which are subequal and slightly shorter than fourth spine; the last spine slightly longer. Soft dorsal rounded, all rays forked. Anal spines increasing in length from first to third which is slightly shorter than third dorsal spine. Soft anal somewhat rounded, all rays forked. Pectorals rounded, half length of snout shorter than head. Ventrals equal to head without snout. Caudal slightly rounded. Lateral line with about 12 tubes, irregular and incomplete on tail. Colour of preserved specimens lighter or darker brown, uniform or marmorated with darker. A white blotch on lateral line below 8th dorsal spine may be present, as also a white transverse band connecting upperborders of eyes. Body sometimes with distant black spots. Dorsal dark brown with a narrow white border, anterior part of spinous dorsal often blackish, soft dorsal often pale. Anal brown with an iregular, white, transverse band. Caudal hyaline with a cloudy, light brown, transverse band. Pectorals dark, narrowly bordered by white, sometimes with irregular light patches. Ventrals brown with a light border. Length over 100 mm.

Habitat: Sumatra (Padang); Simalur!; Java (Jakarta, Labuan, Batu Ulo!); Celebes (Gorontalo); Ambon; New Guinea?. — Philippines, In sea and brackish water, entering rivers.

2. **Tetraroge leucogaster** (Rich.)

Apistes leucogaster Richardson, Zoology Samarang, Fishes, 1848, p. 5.
Apistus leucogaster Bleeker, Nat. Tijdschr. Ned. Indië IV, 1853, p. 111.
Prosopodasys leucogaster Günther, Cat. Brit. Mus. II, 1860, p. 141.
Prosopodasys leucogaster Kner, Sitzber. Akad. Wien LVIII, 1868, p. 309.
Prosopodasys leucogaster Playfair, Proc. Zool. Soc. London, 1869, p. 240.
Gymnapistus leucogaster Bleeker, Verh. Akad. Amsterdam XVI (1873) (1876). Mém. Scorpénoides, p. 88. — Atl. Ichth. IX, 1879. Tab. CCCCXI. Fig. 6.
Paracentropogon leucoprosopon M. Weber, Siboga Exp. Fische, 1913, p. 498 (nec Blkr.).
Gymnapistus leucogaster M. Weber, ibid. p. 502.
?*Tetraroge albifrons* Duncker & Mohr, Mit. Zool. Mus. Hamburg XLIV, 1929, p. 70 (pro parte).
Vespicula leucogaster Herre, Bull. Raffles Mus. No. 16, 1940, p. 48.
Gymnapistus leucogaster Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 451.

D. XIII. 8. A. III. 6. P. 1. 14. V. I. 5.

Height 2.8, 3.6—3.8 in length with caudal. Head 2.25—3, 3—3.6 in length with caudal. Eye 2.7—2.9, Snout 1.5—1.7 in eye. Interorbital space slightly concave, 2—2.25 in eye. Mouth oblique. Maxillary reaching to below hindborder of pupil. Villiform bands of teeth in the jaws, on vomer and on palatines. Preorbital with two spines, the anterior one short and directed downward, the posterior one directed backward and longer, about two thirds of eye. Hindborder of preopercle with a long spine, and four shorter ones below it.

Three diverging opercular spines, the superior one poorly developed. A deep groove on each side of dorsal, above posterior part of eye. Origin of dorsal above middle of eye. First dorsal spine more than half length of second, which is slightly less than third. Third spine about as long as snout and eye. Following spines but slightly shorter than third one. Anal spines increasing in length from first to third, which is as long as snout. Pectorals almost as long as head. Ventrals as long as head without snout. Caudal slightly rounded. Colour of preserved specimens brownish, freckled with darker and with irregular white blotches. Thorax and belly white. Head often with a white patch on interorbital space, extending on snout and on base of dorsal. Dorsal and anal freckled with brown. Median part of dorsal and back below it sometimes white. A broad, subterminal, dark band on caudal, which otherwise is white. Bases of pectorals and ventrals white, distally both fins are freckled with brown. Length 70 mm.

Habitat: Singapore; Lombok!; Ceram; Timor; between Misool and Salawatti!; New Guinea? — Zanzibar, Seychelles, Muscat, Baluchistan coast, China, Philippines, Australia (Adelaide).

3. **Tetraroge niger** (C. V.) (Fig. 16, p. 67)

Apistus niger Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 415.
Apistus amblycephalus Bleeker, Nat. Tijdschr. Ned Indië I, 1850, p. 27. — Ibid. IV, 1853, p. 250.
Tetraroge amblycephalus Günther, Cat. Brit. Mus. II, 1860, p. 133.
Prosopodasys niger Günther, ibid. p. 141.
Gymnapistus niger Day, Fishes of India, Part I, 1875, p. 156.
Gymnapistus niger Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 86. Atl. Ichth. IX, 1879. Tab. CCCCXI. Fig. 3.
Prosopodasys nigra Sauvage, Nouv. Arch. Mus. (2) I, 1878, p. 131.
Gymnapistus niger Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 299.
Gymnapistus niger Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 452.
Gymnapistus niger Munro, The marine and fresh water fishes of Ceylon, 1955, p. 245.

D. XIII. 8. A. III. 5. P. 12. V. I. 5 .

Height 2.4—2.9, 3.1—3.6 in length with caudal. Head 2.3—2.6, 2.8—3.3 in length with caudal. Eye 3.6—5, equal to or slightly shorter than snout. Interorbital space flat, equal to or somewhat shorter than eye. Mouth somewhat oblique. Maxillary reaching to below posterior part of eye, in a large specimen beyond eye. No barbels. Villiform, narrow bands of teeth in jaws, on vomer and in a patch on anterior part of palatines. Anterior preorbital spine very short, directed downward; posterior one long and slender, reaching backward to below middle of eye or somewhat further. Hindborder of preopercle with a strong spine, and with some knob-like spines below it. No pit behind eye. Origin of dorsal above posterior part of eye. First dorsal spine less than one third of second, which is longest, and equal to snout and eye. Third spine slightly shorter than second and somewhat longer than fourth spine, which is as long as fifth. Sixth and following spines subequal, shorter than fifth spine. Distance between second, third, and fourth spines greater than that between the others. Soft dorsal rounded, higher than posterior part of spinous dorsal, the longest rays as longest spines. Anal spines increasing in length from first to third, which is as long as third or fourth dorsal spines. Soft anal slightly rounded, its longest rays as long as those of dorsal. Ventrals shorter than pectorals, which are as long as head without snout. Caudal slightly rounded. Skin of head and body covered with very small rounded papillae. Colour of preserved specimens varying from almost uniform dark brown to greyish with irregular dark blotches and spots. All fins with a white border and a dark, cloudy, broad, subterminal band, less distinct on posterior part of spinous dorsal. Rest of fins dusky with dark blotches and spots. Caudal generally not dusky but white. Length 135 mm.

Habitat: Sumatra (Priaman, Trussan, Padang); Nias; Bali; Celebes (Menado!, Klabat di Atas, Tombariri, Gorontalo); Buru; Ceram!; Ambon!; Babber!; Tenimber Islands; New Guinea (River Klipong!). — Seas of India, Ceylon, Andamans, Philippines.

In sea and estuaries, entering freshwater.

16. **Vespicula** Jordan & Richardson

(Jordan & Richardson, Publ. Bur. Sci. Manila. Checklist Philipp. Arch. 1910 p. 52)

Prosopodasys Günther, Cat. Brit. Mus. II, 1860, p. 139 (nec Cantor).

More or less compressed. Body covered with rudimentary scales. Head rather pointed. Upper part of head without spinous ridges. Preorbital with two unequal spines. Suborbital ridge without spines. Three or four spines on hindborder of preopercle, the uppermost the longest. Lower jaw the longer, with a more or less distinct symphysial knob. Villiform teeth in jaws, on vomer, and on palatines. Origin of dorsal above hindborder of eye or behind eye, consisting of XII—XVI spines and 4—8 rays. The three anterior dorsal spines remote from the rest of the fin and connected with it by a very low membrane. Anal with III spines and 4—6 rays. All dorsal and anal rays forked. Last dorsal and anal rays connected with caudal peduncle by membranes. Pectoral without free rays. Ventrals with a spine and 4—5 rays. Gill membranes free from isthmus. No cleft behind fourth gill. Six or seven branchiostegals.

Distribution: Indic and West-Pacific.

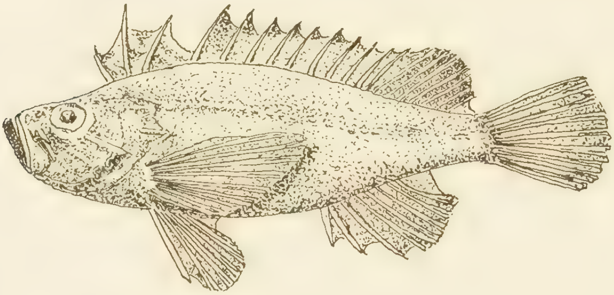

Fig. 17. *Vespicula depressifrons* (Rich.) × 4/5 nat. size.

Key to the Indo-Australian species of Vespicula

a. Dorsal XIII. 8 or XIV. 7, beginning above posterior border of eye. V. I. 5. Snout shorter than eye . . . . 1. *V. zollingeri* p. 72.

b. Dorsal XV. 4—5 or XVI. 3, beginning behind eye, but before hindborder of preopercle. V. I. 4. Snout equal to or longer than eye . . 2. *V. trachinoides* p. 73.

c. Dorsal XIII—XIV. 6—8, beginning above hindborder of preopercle. V. I. 5. Snout longer than eye . . . . 3. *V. depressifrons* p. 74.

1. **Vespicula zollingeri** (Blkr.)

Apistus Zollingeri Bleeker, Journ. Ind. Arch. III, 1849, p. 636. — Verh. Bat. Gen. XXIII, 1849. Bijdr. kennis Scleroparei, p. 8.

Prosopodasys zollingeri Günther, Cat. Brit. Mus. II, 1860, p. 141.

Prosopodasys Zollingeri Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 77. Atl. Ichth. IX, 1879. Tab. CCCCXVII. Fig. 2.

D. XII. 8 or XIV. 7. A. III. 5. P. 11. V. I. 5.

Height 2.8—2.9, 3.5—3.7 in length with caudal. Head 2.7, 3.5 in length with caudal. Eye 3.4. Snout five eighths of eye. Interorbital space nearly flat, twice in eye. Preorbital with two spines, the upper one three fourths of eye, the lower small, directed obliquely downward. Preopercular spine shorter than largest preorbital one, 3 small spines below it on preopercular edge. Mouth very oblique. Maxillary reaching to below hindborder of pupil. Small teeth in bands in jaws, on vomer, and on palatines. Origin of dorsal above hindborder of eye. Second and third dorsal spines subequal, as long as postorbital part of head, the first spine shorter. These three spines close together, separated by a low membrane from the following spines, which are shorter, the median ones longest. Soft dorsal broken in the specimens examined, rounded according to Bleeker. Anal spines increasing in length to the third, which is as long as first dorsal spine. Soft anal broken, rounded according to Bleeker. Pectorals pointed, as long as head. Ventrals slightly more than half eye longer than postorbital part of head. Caudal rounded. Scales small, not imbricate. Colour of preserved specimens brown, fins lighter. Length 50 mm (type of the species in the Leiden Museum examined).

Habitat: Sumbawa!

2. **Vespicula trachinoides** (C. V.)

Apistus trachinoides Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 401.

Apistus trachinoides Richardson, Zool. Voy. Samarang. Fishes, 1848, p. 1.

Apistus trachinoides Bleeker, Verh. Bat. Gen. XXII, 1849. Bijdr. kennis Scleroparei, p. 8.

Prosopodasys trachinoides Cantor, Journ. Asiat. Soc. Bengal XVIII (1849) 1850, p. 1026.

Prosopodasys trachinoides Günther, Cat. Brit. Mus. II, 1860, p. 139.

Prosopodasys trachinoides Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 78. — Atl. Ichth. IX, 1879, CCCCXIII. Fig. 3.

Prosopodasys trachinoides Sauvage, Nouv. Arch. Mus. (2) I, 1878, p. 131.

Gymnapistus trachinoides Tirant, Bull. Soc. Etudes. Indochine, 1883. (reprinted: Serv. océanogr. Pêches. Indochine. 6e note, 1929, p. 15).

Prosopodasys trachinoides Seale, Philipp. Journ. Sci. V, No. 4, 1910, p. 286.

D. XV. 4—5, rarely XVI. 3. A. III. 4—5. P. 1. 12. V. I. 4.

Heigth 2.7—3, 3.5—3.8 in length with caudal. Head 2.7—3, 3.4—3.8 in length with caudal. Eye 4.2—4.8, 1.1—1.3 in snout. Interorbital space flat, equal to eye. Preorbital with two spines, a small anterior one, directed downwards, and a larger one, almost half length of eye, directed backwards. Preopercular spine about as long as posterior preorbital one. Mouth very oblique. Maxillary reaching to below posterior border of eye. Villiform bands of teeth in jaws, on vomer, and on palatines. Origin of dorsal slightly before hindborder of preopercle, but behind eye. Second and third dorsal spines equal to snout and eye, longer than first one. Dorsal spines increasing in length from fourth to last, which is somewhat longer than the second spine. Soft dorsal rounded, not higher than spinous dorsal. Anal spines increasing in length to the third, which is equal to postorbital part of head. Soft anal rounded, its longest rays slightly longer than longest anal spine. Pectorals pointed, as long as head. Ventrals as long as head without snout. Caudal rounded. Colour of preserved specimens brownish. Spinous dorsal with oblique bands and markings, soft dorsal and anal light with a broad, subterminal, brown band, proximally followed by narrower bands. Pectorals light brown with dark brown spots, forming numerous transverse bands. Ventrals light, brown towards the tip. Caudal light with a few brown, transverse bands in its distal part. Length 75 mm (specimens of Bleeker's collection in the Amsterdam Museum seen by me).

Nomen indig.: Termontak (Javanese, Cheribon); Ketu (Bintang).

Habitat: Singapore; Sumatra (Tiku, eastern coast west of Singapore); Bintang; Java (Jakarta!, Cheribon, Surabaya); Borneo (Sandakan). — Mergui Archipelago, Siam, Indochina, Malaca. In sea.

3. **Vespicula depressifrons** (Rich.) (Fig. 17, p. 72)

Apistes depressifrons Richardson, Zool. Voy. Samarang, Fishes, 1848, p. 1.
Apistus binotopterus Bleeker, Nat. Tijdschr. Ned. Indië I, 1850, p. 26.
Apistus plagiometopon Bleeker, ibid. III, 1852, p. 753.
Prosopodasys depressifrons Günther, Cat. Brit. Mus. II, 1860, p. 140.
Prosopodasys depressifrons Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 80. — Atl. Ichth. IX, 1879. Tab. CCCCXII. Fig. 1.
Vespicula depressifrons Herre, Notes Zool. Mus. Stanf. Univ. 1934, p. 65.
Prosopodasys depressifrons Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 458.

D. XIII. 7, rarely XIII. 6, or XIV 6, or XIII. 8. A. III. 5, rarely III. 4 or III. 6. P. 1. 9. 1. V. I. 5.

Height 2.6—3, 3.3—3.7 in length with caudal. Head 2.6—2.9, 3.3—3.7 in length with caudal. Eye 4.7—5.2, 1.2—1.4 in snout. Interorbital space slightly convex, 1.3—1.7 in eye. Preorbital with two spines, a small anterior one, directed downward, and a larger one, about half length of eye, directed backward. Preopercular spine shorter than preorbital spine, a few rudimentary spines below it. Mouth very oblique. Maxillary reaching to below hindborder of pupil. Villiform bands of teeth in jaws, on vomer, and on palatines. Origin of dorsal above hindborder of preopercle. Second and third dorsal spines equal to snout and eye, longer than first one. Dorsal spines increasing in length from fourth to last, which is somewhat longer than the second and third spines. Soft dorsal rounded, somewhat higher than spinous dorsal. Anal spines increasing in length to the third, which equals head without snout. Soft anal rounded, its longest rays longer than longest anal spines. Pectorals rounded, about as long as head. Ventrals half length of snout shorter. Caudal rounded. About 20 tubes in the lateral line. Colour of preserved specimens brown, fins more or less mottled with lighter brown. Caudal often with indistinct, dark, transverse bands. Length nearly 100 mm (specimens of Bleeker's collection in the Amsterdam Museum examined).

Nomen. indig.: Nĕpu (Simalur).

Habitat: Sumatra (Benkulen, Telok Betong!; Trussan, Padang, Tiku, Priaman, Siboga); Simalur!; Nias; Java (Jakarta, Patjitan, Batu Ulo!); Celebes (Bulucomba); Batjan; Buru; Ambon; New Guinea (River Klipong!). — Philippines.
In sea and brackish water.

17. **Amblyapistus** Bleeker

(Bleeker, Versl. Akad. Amsterdam (2) IX, 1876, p. 297)

Compressed. Body covered with small scales, more or less imbedded in the skin, head naked. Upper part of head without spinous ridges. Preorbital with two moderate spines. Suborbital ridge without spines. A moderate preopercular spine and a few rudimentary ones below it. Villiform teeth in jaws, on vomer, and on palatines. Opercle with two weak spines. Origin of dorsal above frontborder of eye, with XV—XVII spines and 7—10 rays. The anterior spines much longer than the posterior ones. Fin membranes not incised. Last dorsal ray connected with base of caudal. Anal with III spines and 5—8 rays. Pectorals without free rays. Ventrals with one spine and 5 rays. Rays of all fins either forked or simple. Gill membranes free from isthmus. No cleft behind the fourth gill. Branchiostegals 6.
Distribution: A few species from the Indic and West-Pacific.

Key to the Indo-Australian species of Amblyapistus

a. Seventeen dorsal spines, 5 anal rays. Dorsal, anal, and pectoral rays forked. Origin of dorsal above eye . . . . 1. *A. taenianotus* p. 76.
b. Fifteen dorsal spines, 7 (8) anal rays. Dorsal and anal rays simple. Origin of dorsal before eye . . . . 2. *A. macracanthus* p. 77.

1. **Amblyapistus taenianotus** (C. V.) (Fig. 18, p. 76)

Apistus taenianotus Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 404.
Apistus taenianotus Richardson, Zool. Voy. Samarang. Fishes, 1848, p. 5.
Apistus taenianotus Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 557.
Tetraroge crista-galli Günther, Cat. Brit. Mus. II, 1860, p. 134.
Tetraroge taenianotus Günther, ibid. p. 136.
Tetraroge taenianotus Bleeker, Ned. Tijdschr. Dierk. I, 1863, p. 234.
Amblyapistus taenianotus Bleeker, Recherches faune Madagascar, 1875, p. 87. — Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 71. — Atl. Ichth. IX, 1879. Tab. CCCCIV. Fig. 6.
Amblyapistus taenianotus Day, Fishes of India, Part I, 1875, p. 157.
Amblyapistus taenianotus Steindachner, Abh. Senckenb. naturf. Ges. XXV, 1901, p. 424.
Amblyapistus taenionotus M. Weber, Siboga Exp. Fische, 1913, p. 498.
Amblyapistus taenionotus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 917.
Amblyapistus taenianotus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 296. — Proc. Acad. Nat. Sci. Philadelphia LXXXVI, 1934, p. 77.
Amblyapistus taenionotus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950, p. 368.
Amblyapistus crista-galli Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 445.
Amblyapistus taenianotus Herre, ibid. p. 446.
Amblyapistus taenianotus Inger, Fieldiana, Zool. 36. no. 3. 1957, p. 375.

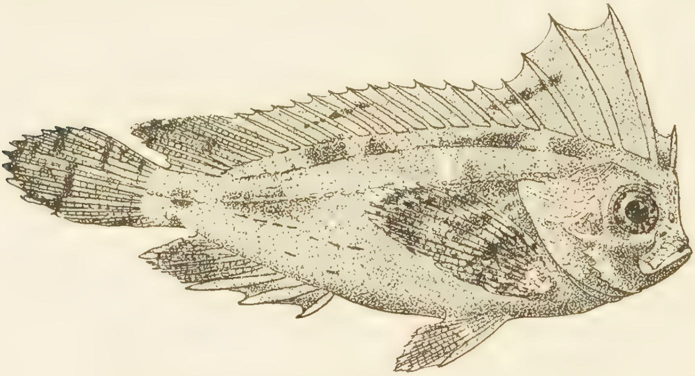

Fig. 18. *Amblyapistus taenianotus* (C. V.) nat. size.

D. XVII. 7—8. A. III. 5. P. 11—12. V. I. 5. Ll. about 90.

Height 2.6—2.8, 3.4—3.7 in length with caudal. Head 2.7—3, 3.6—4.3 in length with caudal. Eye 3.5—4, equal to snout in smaller, more than snout in larger specimens. Interorbital space very convex, 1.4—1.7 in eye. Mouth oblique. Maxillary reaching to below front-border of pupil. Very small teeth in narrow bands in jaws, on vomer, and on palatines. Preorbital with two spines, the superior one half as long as eye, the inferior half as long as the superior one. Hindborder of preopercle with a spine, half as long as eye, and four short, blunt spines below it, the fourth not more than a knob. Origin of dorsal above frontborder of eye. First dorsal spine about one third of second, which is longest and as long as head. Spines decreasing rapidly in length to the sixth, which is half as long as second spine. These spines diverging and with broad, somewhat convex membranes between them. Sixth and following spines subequal, the last one slightly longer. The five anterior dorsal rays as long as posterior spines, the last ones rapidly decreasing in length, the fin being slightly pointed behind. A low membrane connects it with the caudal. Origin of anal below last dorsal spine. Anal spines increasing in length posteriorly, the first less than half length of third, which is as long as fourth dorsal spine. Dorsal and anal rays forked. Pectorals as long as head or slightly longer, reaching to anus, sometimes even reaching on anal. Pectoral rays forked, with exception of the first and of a few of the posterior ones. Ventrals shorter than pectorals, reaching anus. Caudal rounded. Lateral line with 21—24 tubes. Thorax scaled. Head naked. Colour of preserved specimens darker or lighter brown, with more or less distinct irregular dark streaks on body and fins. Thorax and belly sometimes milky white. Length 116 mm.

Habitat: Borneo (Pulo Bakkungaan Kechil); Bali; Celebes (Menado); Biaru!; Beo!; Ternate; Buru!; Ceram; Ambon!; Samau!; Timor; New Guinea (Dörper Spitze). — Mauritius, Mozambique, Andamans, China, Japan, Philippines, Solomon Islands, Fiji.

Note. I have followed Bleeker in uniting *Tetraroge cristagalli* Günther with *taenianotus*. Günther gives as differences the shorter pectoral and ventral of his species. In the specimens examined by me the pectorals reach to the anus, sometimes even on the anal, hence their length shows some variability and it can not be used to distinguish between two species.

2. **Amblyapistus macracanthus** (Blkr.)

Apistus macracanthus Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 267.
Tetraroge macracanthus Günther, Cat. Brit. Mus. II, 1860, p. 133.
Tetraroge macracanthus Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 189.
Amblyapistus macracanthus Day, Fishes of India, Part I, 1875, p. 68.
Amblyapistus macracanthus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 73. — Atl. Ichth. IX, 1879. Tab. CCCCXIV. Fig. 3.

Amblyapistus macracanthus Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 447.

D. XV. 7 (8)—9 (10). A. III. 7 (8). P. 2. 9. or 1.10. V. I. 5.

Height 2.85—3.2, 3.85—4.2 in length with caudal. Head 3.2—3.5, 4.2—4.8 in length with caudal. Eye 3.5—3.6, 1.1—1.4 in snout, and slightly more than convex interorbital space. Mouth small, oblique. Maxillary reaching to below frontborder of pupil. Villiform bands of teeth in jaws, on vomer, and on anterior part of palatines. Preorbital with two spines, the upper one reaching to below middle of eye, the lower one much smaller. Hindborder of preopercle with a short, blunt spine, four smaller ones below it. Origin of dorsal on snout, before eyes. First dorsal spine equal to eye, second one 4 or 5 times as long, longer than head, third somewhat shorter than second, fourth and following spines subequal, as long as postorbital part of head. Soft dorsal pointed, the longest rays as long as head without snout. Anal spines increasing in length to the third, which equals postorbital part of head in length. Soft anal pointed, the longest rays as long as those of dorsal. All dorsal and anal rays simple. Pectorals longer than head, the 9 or 10 posterior rays forked. Ventrals equal to head without snout. Caudal rounded. Lateral line with about 18—22 tubes. Scales small, not imbricate. Head naked. Colour of preserved specimens brown, the fins light brown, the vertical fins dark edged. Length 86 mm. (Description made after the typical specimens of Bleeker's collection in the Leiden Museum).

Habitat: Batjan!; Ceram! — Maldives, Andamans, Philippines.

18. **Neocentropogon** Matsubara

(Matsubara, Trans. Sigenkagaku Kenkyusyo 2, 1943, p. 430)

Gadapistus de Beaufort, Copeia 1949, No. 1, p. 68.

Compressed, head somewhat depressed. Body covered with very small scales, imbedded in the skin. Head naked, its upper part without spiny ridges. Preorbital with two spines. Suborbital ridge without spines. Hindborder of preopercle with a spine and a few smaller ones below it. Villiform teeth in jaws, on vomer, and on palatines. Lower jaw slightly the longer, with a symphysial knob. Origin of dorsal immediately behind eye. Dorsal consisting of XIV spines and 8(9) rays which are partly forked. Anal with III spines and 7 forked rays. Dorsal and anal connected to caudal peduncle by membranes. Pectorals without free rays, most of their rays forked. Ventrals with one spine and 5 rays. Gill membranes free from isthmus. No cleft behind the fourth gill. Branchiostegals 6.

Distribution that of the single species known.

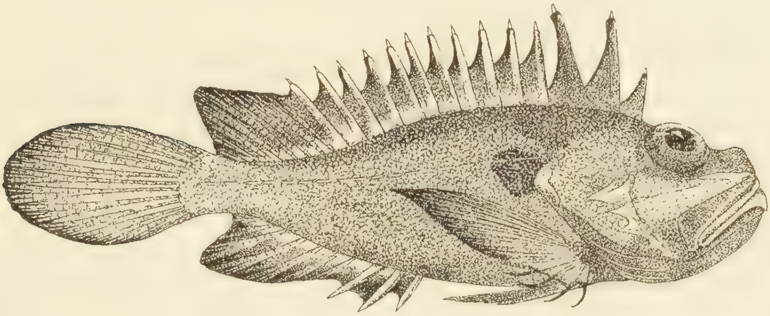

Fig. 19. *Neocentropogon aeglefinus* (M. Weber). × 5/7.

1. **Neocentropogon aeglefinus** (M. Weber) (Fig. 19, p. 79)
Paracentropogon aeglefinus Max Weber, Siboga Exp. Fische, 1913, p. 500.

D. XIV. 8 (9). A. III. 7. P. 14—15. V. I. 5. Ll. 130—140.

Height 2.8—3.2, 3.8—4.2 in length with caudal. Head 2.4—2.6, 3.1—3.5 in length with caudal. Eye oval, 3—3.7. Snout somewhat shorter than eye in small specimens, somewhat longer than eye in large ones. Interorbital space flat, 1.9—2.2 in eye. Mouth somewhat oblique. Maxillary reaching to below middle of eye. A sharp bony knob at symphysis of lower jaw. Narrow bands of villiform teeth in jaws, on vomer and on palatines. Preorbital movable, with a small anterior and a large posterior spine, which is as long as or somewhat shorter than eye. Hindborder of preopercle with a long spine, and four small spines below it, the two inferior ones rudimentary or even absent in large specimens. Origin of dorsal immediately behind eye. First dorsal spine less than half or equal to half length of second, which is as long as third, and equal to postorbital part of head. Following spines shorter. Anal spines increasing in length from first to third, which is as long as longest dorsal spine. Median dorsal rays and all anal rays forked; anterior and posterior dorsal rays simple or indistinctly forked. Median pectoral rays forked, the others simple. Pectorals less than half length of snout shorter than head. Ventrals about equal to postorbital part of head. Caudal rounded. Head and thorax naked, body covered with small cycloid scales. Lateral line with about 23 tubes, getting irregular on caudal peduncle. Colour of preserved specimens yellowish brown. A dark blotch behind gill opening, immediately below lateral line, seldom wanting. Fins often dusky. Length 150 mm.

Habitat: Halmahera Sea!; Timor Sea!; Savu Sea!; Saleh Bay, Sumbawa! On sandy bottom, 95—274 m.

19. **Paracentropogon** Bleeker

(Bleeker, Versl. Akad. Amsterdam (2) IX, 1876, p. 297)

?*Hypodytes* Gistel, Naturgesch. Thierreichs, 1848, p. VIII.

Body covered with rudimentary scales, more or less imbedded in the skin. Head naked. Upper part of head without spinous ridges. Preorbital movable, with a short and a very long spine. Villiform teeth in jaws, on vomer, and on palatines. Hindborder of preopercle with a long spine and some small spines below it. Origin of dorsal above eye, with XII—XV spines and 6—9 rays, which are forked or simple. Anal with III spines and 4—5 rays. Pectorals without free rays, at least the median rays forked. Ventrals with a strong spine and 4 rays. Branchiostegals 6. No cleft behind the last gill arch.

Distribution: Indic and West-Pacific.

Key to the Indo-Australian species of Paracentropogon

a. All dorsal and anal rays forked.
    a^1. Anterior preorbital spine directed backwards . . . . 1. *P. longispinis* p. 80.
    b^1. Anterior preorbital spine directed downwards . . . . 2. *P. zonatus* p. 82.
b. All dorsal and anal rays simple. . . . . . 3. *P. leucoprosopon* p. 83.

1. **Paracentropogon longispinis** (C. V.) (Fig. 20, p. 81)

Apistus longispinis Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 408.
Apistus fusco-virens Cuvier & Valenciennes, ibid. p. 409.
Apistus longispinis Quoy & Gaimard, Voyage Astrolabe. Zool. III, 1834, p. 694.
Apistus fusco-virens Quoy & Gaimard, ibid. p. 695.
Apistus hypselopterus Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 238.
Apistus fusco-virens Bleeker, ibid. III, 1852, p. 269.
Tetraroge longispinis Günther, Cat. Brit. Mus. II, 1860, p. 134.
Gymnapistus hypselopterus Bleeker, Versl. Akad. Amsterdam XVI, 1864, p. 360.
Centropogon hypselopterus Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 188.
Centropogon fusco-virens Bleeker, l.c.

Tetraroge longispinis Bleeker, ibid. p. 286.
Prosopodasys (*Tetraroge*) *longispinis* Bleeker, ibid. IV, 1872, p. 141.
Amblyapistus longispinis Day, Fishes of India, Part I, 1875, p. 157.
Paracentrogopon longispinis Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 67. — Atl. Ichth. IX, 1879, Tab. CCCCXII. Fig. 4.
Paracentropogon longispinis Steindachner, Ann. Hofmuseum Wien XI, 1896, p. 203.
Paracentropogon longispinis Jordan & Richardson, Bull. Bur. Fish. XXVII (1907) 1908, p. 280.
Paracentropogon longispinis Herre & Myers, Bull. Raffles Mus. XIII, 1937, p. 33.
Paracentropogon longispinis Fowler, Hongkong Naturalist. Suppl. 1938, p. 36.
Paracentropogon longispinis Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 449.

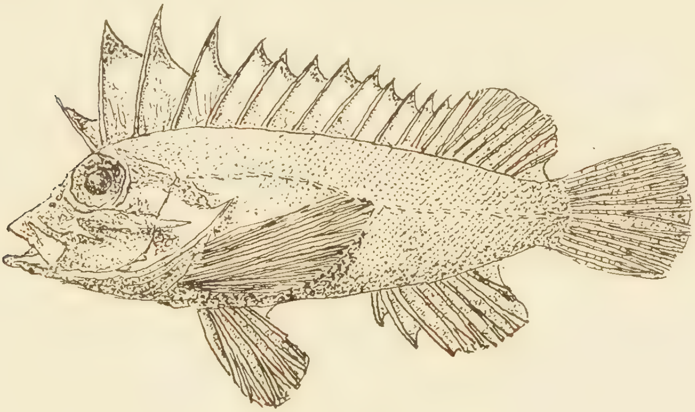

Fig. 20. *Paracentropogon longispinis* (C. V.) nat. size.

D. XIV. 8 or XV. 7. A. II. 5. 1) P. 1. 8—9. V. I. 4. Sq. l. 65—75. Ltr. $\begin{array}{c}9\text{-}10\\ \hline 1\\ \hline 24\text{-}25\end{array}$.

Heigth 2.7—2.9, 3.4—3.8 in length with caudal. Head 2.6—3, 3.4—3.8 in length with caudal. Eye 2.9—3.5. Snout 1—1.3 in eye. Flat interorbital space 1.4—1.8 in eye. Mouth oblique. Maxillary reaching to below anterior half of eye. Villiform teeth in jaws, on vomer, and on palatines. Anterior nostril with a short flap, posterior nostril immediately in front of eye, in horizontal level of pupil. Preorbital with two spines, directed backwards, the anterior one much shorter than the posterior one, which is as long as eye. Hind-

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1) A specimen of Bleeker's collection in the Amsterdam Museum has A. IV. 4 (5).

border of preopercle with a strong spine, hardly shorter than the posterior preorbital one, and with about 4 short and blunt spines below it. Opercle with three spines. Origin of dorsal above middle of eye. First dorsal spine as long as snout and half eye, second spine about twice as long as first one, shorter than third, which is longest and equal to head without snout; following spines gradually decreasing in length to the last, which equals snout and eye. Soft dorsal rounded, all rays forked. First anal spine shorter, second spine longer than first dorsal spine; third longest and about as long as last dorsal spine. Soft anal somewhat rounded, all rays forked. Ventrals as long as head without snout. Pectorals somewhat longer, but not as long as head. With exception of the first, all pectoral rays are forked. Caudal slightly rounded. Colour of preserved specimens dark brown or reddish brown, more or less mottled with lighter. Usually a white, round patch below tenth dorsal spine, immediately above lateral line. Fins, specially soft dorsal and pectorals, with white mottlings. Length over 100 mm.

Habitat: Singapore; Lombok!; Borneo (Sandakan); Celebes (Badjoa); Buru; Ceram; Gisser!; Ambon; Saparua; Banda!; Misol. — Coasts of India, Annam, China, Philippines.

2. **Paracentropogon zonatus** (M. Weber)

Prosopodasys zonatus M. Weber, Siboga Exp. Fische, 1913, p. 502.
Prosopodasys zonatus Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 459.

D. XV. 7. A. III. 5. P. 1. 10. V. I. 4.

Height equal to head, 2.5—2.9, 3—3.6 in length with caudal. Eye 2.8—3.4. Snout 1—1.2 in eye. Almost flat interorbital space 1.6—1.7 in eye. Maxillary reaching to below anterior half of eye. Villiform bands of teeth in jaws, on vomer and on palatines. Preorbital with two spines, the short, anterior one directed downward, the posterior one longer, as long as eye. Hindborder of preopercle with a strong spine, as long as longest preorbital one, and with 4 rudimentary ones below it. No distinct spines on opercle. Origin of dorsal above middle of eye. First dorsal spine as long as eye; second spine about twice as long as first, equal to head without snout and longer than third spine. Fourth and following spines shorter, subequal, as long as snout and eye. Soft dorsal rounded, all rays forked. First anal spine shorter than first dorsal spine, second anal spine as long as first dorsal spine, third as long as last dorsal spine. Soft anal rounded, all rays forked. Ventrals as long as postorbital part of head and half eye. Pectorals almost as long as head. Caudal slightly rounded. Colour of preserved specimens brownish; a light nuchal band, a white blotch below 11th dorsal spine, two light, transverse bands on caudal peduncle, one at its beginning and one at base of caudal. Dorsal pinkish terminally, otherwise hyaline with white spots. A large dark blotch between 5th to 7th dorsal spines. Anal, caudal, pectorals, and ventrals with more or less distinct white spots. Length 52 mm.

Habitat: Postillion Islands!; Sulu Archipelago! — In sea.

Note. This species is near *P. longispinis,* differing by the position of the anterior preorbital spine, which is directed downward and not backward, and, when specimens of equal size are compared, by the profile of the head, the snout being blunter. Moreover the coloration is different.

3. **Paracentropogon leucoprosopon** (Blkr.)

Apistus leucoprosopon Bleeker, Acta Soc. Indo-Neerl. I, 1856. Beschr. vischs. Amboina, p. 35.

Centropogon leucoprosopon Günther, Cat. Brit. Mus. II, 1860, p. 130.

Paracentropogon leucoprosopon Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 69. — Atl. Ichth. IX, 1879. Tab. CCCCXIII. Fig. 2.

D. XIV. 8. A. III. 4 (5). P. 10. V. I. 4.

Height 2.8, 3.5 in length with caudal. Head. 2.8, 3.5 in length with caudal. Eye 3.3, equal to snout. Interorbital space almost flat, with two parallel ridges, half length of eye. Mouth oblique. Maxillary reaching to below frontborder of pupil. Villiform teeth in jaws, on vomer, and on palatines. Preorbital with two spines, the superior one directed backward, reaching to below hindborder of pupil, the inferior one minute, directed obliquely downward, Preopercle with a strong spine, two thirds length of eye and not longer than superior preorbital spine; four rudimentary spines below it. Two divergent ridges on opercle, without distinct spines. Origin of dorsal above middle of eye. First dorsal spine more than half length of second, which is longest and half eye longer than postorbital part of head. Following spines slightly decreasing in length to the last. Longest ray of rounded soft dorsal as long as 4th dorsal spine. First anal spine shorter than first dorsal spine, second anal spine as long as last dorsal spine, third equal to fourth dorsal spine in length. Alll dorsal and anal rays simple. Pectorals half length of snout shorter than head. Ventrals as long as head without snout. Caudal slightly rounded. Scales small, but distinct; about 21 in the Ltr. between origin of anal and lateral line. Lateral line with

12 tubes, ending below the beginning of the soft dorsal. Colour of preserved specimens brown. Interorbital space and snout milky white. According to Bleeker the caudal is dark brown with a narow, yellow, terminal edge, and a broad, reddish brown, transverse band. Length 36 mm (type of species in Leiden Museum examined).

Habitat: Singapore; Ambon! In sea.

20. **Cottapistus** Bleeker

(Bleeker, Versl. Akad. Amsterdam (2) IX, 1876, p. 298)

Compressed. Body partly covered with small rudimentary scales. Head naked, its upper part without spinous ridges; its anterior profile convex. Preorbital with two spines. Suborbital ridge without spines. Hindborder of preopercle with a spine and three rudimentary spines below it. Villiform teeth in jaws, and on vomer, none on palatines. Opercle without spines. Origin of dorsal before eye. Dorsal consisting of XIV spines and 8 forked rays. Anal with III spines and 7 forked rays. Dorsal and anal connected to caudal peduncle by membrane. Pectorals with 4 forked and 10 simple rays. No free pectoral rays. Ventrals with a spine and 4 rays. Gill membranes free from isthmus. No cleft behind the fourth gill. Branchiostegals 6.

Distribution that of the single species known.

1. **Cottapistus cottoides** (C. V.) (Fig. 21, p. 85)

Perca cottoides Linné, Mus. Adolphi Friederici, 1754, II, p. 84.
Apistus cottoides Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 410.
Apistus cottoides Richardson, Zool. Samarang, Fishes, 1848, p. 4.
Apistus cottoides Bleeker, Nat. Tijdschr. Ned. Indië IV, 1853, p. 459.
Prosopodasys cottoides Günther, Cat. Brit. Mus. II, 1860, p. 142.
Prosopodasys cottoides Hutton, Fishes of New Zealand, 1872, p. 11.
Cottapistus cottoides Bleeker, Verh. Akad. Amsterdam (1873) 1876. Mém. Scorpénoides. p. 75. Ichth. IX, 1879. Tab. CCCCXV. Fig. 7.

D. XIV. 7. A. III. 7. P. 1. 4. 8 or 1. 5. 8. V. I. 4.

Height 3.15, 4 in length with caudal. Head 2.7, 3.5 in length with caudal. Eye 4.6, 1.4 in snout and in flat interorbital space. Profile of head convex. Anterior and posterior nostrils with a short flap. Maxillary reaching to below hindborder of eye. Bands of teeth in jaws and on vomer, none on palatines. Preorbital with two spines, directed backwards, the upper one much longer than the lower one, and slightly shorter than eye. Preopercular edge with 3—5 spines, the uppermost or the two superior ones larger than the others, the last one sometimes rudimentary. No opercular spines. Origin of dorsal on snout, before eye. First dorsal spine as long as snout, third spine longest, equal to postorbital part of head. Following spines subequal, not much shorter than third spine. Membranes between first and second, second and third, and third and fourth spines deeply incised, those between the following spines less so. Soft dorsal lower than spinous part. Anal spines increasing in length to the third, which equals snout and half eye. Longest anal rays as long as snout and eye. Dorsal and anal rays forked. Pectorals equal to head without snout, the first ray simple, the following 4 or 5 rays forked, the lower ones again simple. Ventrals slightly shorter than pectorals. Caudal rounded. Anterior part of back and thoracal region scaleless, rest of body covered with very small scales. About 20 tubes in lateral line. Colour of preserved specimens brownish above, lighter below. Head, body and fins covered with darker, irregular blotches and cloudy markings, the blotches often lighter in the centre and forming dark edged ocelli, specially on the sides of the head. On the caudal the blotches form narrow vertical stripes. Length 87 mm (specimens of Bleeker's collection in Leiden Museum examined).

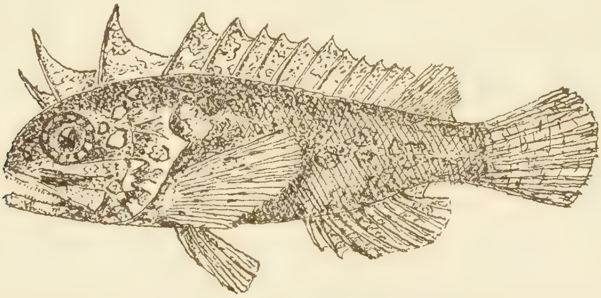

Fig. 21. *Cottapistus cottoides* (C. V.). After Bleeker, nat. size.

Habitat: Singapore!; Banka; Java (Bay of Jakarta); Borneo. — China, New Zealand?

21. **Sibogapistus** de Beaufort

(de Beaufort, Copeia 1949, No. 1, p. 68)

Rather compressed. Body partly covered with small, rudimentary scales, imbedded in the skin. Head naked, its upper part without spinous ridges; its anterior profile straight with a slight concavity. Preorbital with two spines. Suborbital ridge without spines. Hindborder of preopercle with a spine and some rudimentary spines below it. Villiform teeth in jaws and on vomer, none on palatines. Opercle without spines. Origin of dorsal slightly before or above anterior half of eye. Dorsal consisting of XIII—XIV spines and 6—8 (9) rays, which are feebly forked. Anal with III spines and 6 feebly forked rays. Dorsal and anal connected by membrane with caudal peduncle. Pectorals without free rays, all rays simple or a few forked. Ventrals with a spine and 4 rays. Gill membranes free from isthmus. No cleft behind the fourth gill. Branchiostegals 6.

Distribution that of the two species known.

Note. This genus is very near *Cottapistus,* differing in the straight profile of the head, and in the dorsal and anal not being connected with the caudal peduncle.

Key to the Indo-Australian species of Sibogapistus

a. Origin of dorsal slightly before eye. D. XIV. 6 1. *S. cynocephalus* p. 86.
b. Origin of dorsal above frontmargin of pupil.
D. XIII. 8 (9) . . . . 2. *S. pleurostigma* p. 87.

1. **Sibogapistus cynocephalus** (M. Weber) (Fig. 22, p. 86)

Paracentropogon cynocephalus M. Weber, Siboga Exp. Fische, 1913, p. 501.
Paracentropogon cynocephalus Herre & Myers, Bull. Raffles Mus. XIII, 1937, p. 33.

D. XIV. 6. A. III. 6. P. 14. V. I. 4.

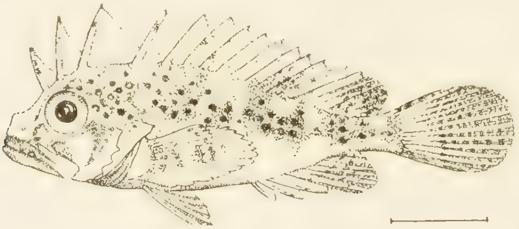

Fig. 22. *Sibogapistus cyanocephalus* (M. Weber).

Height 2.8, 3.6 in length with caudal. Head 2.4, 3.1 in length with caudal. Eye 3.6, equal to snout and to convex interorbital space. Mouth slightly oblique. Maxillary reaching almost to below hindborder of eye. Villiform bands of teeth in jaws, a few minute teeth on vomer, none on palatines, Preorbital movable, with two spines, the anterior small and directed downward, the posterior larger, but less than eye, directed backward. Hindborder of preopercle with 4 spines, the upper one the longest, the last one minute. Origin of dorsal slightly before eye. First dorsal spine less than eye, third and last spines longest, as long as snout and eye. First and second anal spines subequal, third longest, as long as longest dorsal spines. Dorsal and anal rays forked. Ventrals almost as long as head without snout, pectorals longer, but shorter than head. Third to sixth pectoral rays slightly forked at tip, others simple. Caudal truncate. Scales minute, imbedded in the skin. Lateral line with about 17 or 18 tubes, opening upwards, none on caudal peduncle. Colour of preserved specimens sand coloured with darker markings on sides of body. Length 52 mm.

Habitat: Singapore; Molo Strait!; Sea of Flores!

2. **Sibogapistus pleurostigma** (M. Weber) (Fig. 23, p. 87)

Paracentropogon pleurostigma M. Weber, Siboga Exp. Fische, 1913, p. 499.

D. XIII. 8 (9). A. III. 6. P. 13—14. V. I. 4.

Height 2.1—2.2, 2.8—9 in length with caudal. Head 2.2—2.4, 2.9—3.2 in length with caudal. Eye round, 3.1—3.3. Snout 1.1—1.4 in eye. Interorbital space with a longitudinal ridge, 1.6—2 in eye. Mouth somewhat oblique. Maxillary reaching to below middle of eye. Villiform bands of teeth in the jaws and on vomer, none on palatines. Preorbital movable, with a short anterior and a long posterior spine, slightly shorter than eye. Hindborder of preopercle with a moderate spine and some rudimentary ones below it. No opercular spines. Origin of dorsal above frontmargin of pupil. Anterior spines diverging, first half as long as second, third longest, equal to snout and eye. Anal spines increasing in length from first to third, which is as long as first dorsal spine. Dorsal and anal rays simple or feebly forked. Pectoral rays simple. Ventral spine

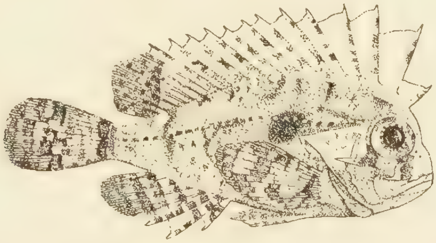

Fig. 23. *Sibogapistus pleurostigma* (M. Weber).

strong, but the rays poorly developed. Pectorals about as long as head, ventrals as long as head without snout. Body with small scales, with exception of anterior part of back and of belly, which are naked. About 22 tubes in the lateral line, which is more or less interrupted on caudal peduncle. Caudal rounded. Colour of preserved specimens yellowish brown, marbled with darker on sides. A large, dark brown blotch behind gill opening, on, but for its greater part below, lateral line. All fins with more or less distinct brown bands, each band bordered by dark along the sides. Length 50 mm.

Habitat: Between Salawatti and Misol, 32 m!

22. **Snyderina** Jordan & Starks

(Jordan & Starks, Proc. Cal. Acad. Sci. (3) II. Zool. 1901, p. 381)

Compressed, body covered with small non imbricate scales. Head naked, its upper part without spiny ridges, its upper profile with a concavity before eye. Preorbital with two or three spines. Suborbital ridge without spines. Hindborder of preopercle with a spine and with or without rudimentary spines below it. Villiform teeth in jaws and on vomer, none on palatines. Opercle without spines. Origin of dorsal above middle of eye. Dorsal consisting of XII—XIII spines and 10—12 forked rays. Anal with III spines and 5—7 forked rays. Dorsal and anal connected by membrane to caudal peduncle. Pectorals without free rays. Ventral with a spine and 5 rays. Gill membrane free from isthmus.

Distribution: Two species are known, *S. yamanokami* from Japan and the Sulu Islands and *S. guentheri* from the Gulf of Oman and the Gulf of Aden.

1. **Snyderina yamanokami** Jordan & Starks (Fig. 24, p. 89)

Snyderina yamanokami Jordan & Starks, Proc. Calif. Acad. Sci. (3) II. Zool. 1901, p. 381. — Proc. U. S. Nat. Mus. XXVII, 1903, p. 165.
Snyderina yamanokami Koumans, Temminckia IX, 1953, p. 259.

D. XII. 10 (11). A. III. 7. P. 15. V. I. 5.

Height 2.4, 3 in length with caudal. Head 2.3, 2.9 in length with caudal. Eye 3.75, 1.1 in snout. Interorbital space convex, three fourths of eye. Nostrils before eye, the anterior with a flap. Two bony ridges beginning above posterior nostril, converging on interorbital space, and continued as a rather broad, single, median ridge to base of first dorsal spine. Preorbital with two short, blunt spines directed forward and downward, and a strong spine, three fourths of eye, directed backwards. Preopercular spine slightly shorter; about 6 knob like spines below it. Mouth oblique. Maxillary reaching to below anterior third of eye. Villiform teeth in jaws and on vomer, none on palatines. About 4—6 short gill rakers on lower part of anterior arch. First dorsal spine 1.23 in eye, 2.3 in second spine and 2.38 in third and longest spine. Soft part of dorsal pointed, the longest ray slightly longer than third dorsal spine. Third anal spine longest, slightly shorter than second dorsal spine. Soft part of anal pointed, the longest ray as long as second dorsal spine. Pectorals pointed, reaching on spinous part of anal, 1.25 in head. Ventrals 1.7 in head. Caudal rounded. Twenty three tubes in lateral line. Colour of preserved specimen reddish brown. A dusky blotch above eye. A dark, oblong blotch behind head along lateral line. A smaller dark blotch below the 6th—8th dorsal spines and another similar one below last dorsal spines and anterior rays. A dark line along base of caudal, which, as the anal, has rows of dark spots. Pectorals and ventrals reddish brown. Length of specimen described 87 mm.

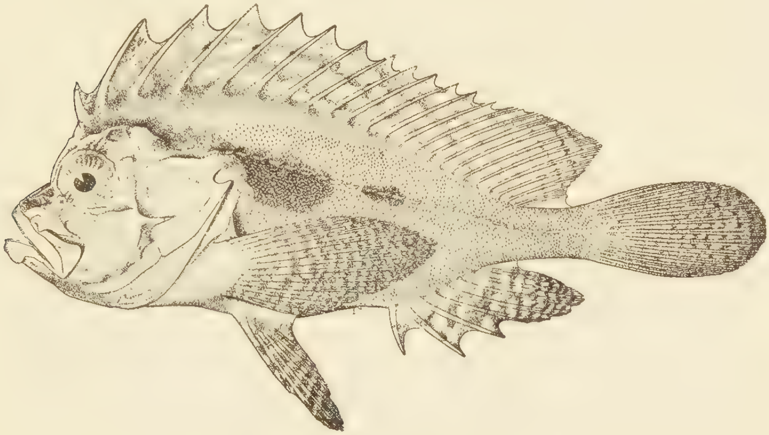

Fig. 24. *Snyderina yamanokami* Jordan and Starks. After Jordan and Starks.

Habitat: Sulu Sea, 72—80 m! — Japan.

Note. As far as I know only two specimens of this species are know: the type, 217 mm long, from Japan, and the specimens described above and recorded by Koumans l.c. Koumans already pointed out that his specimen differs from the type in fin counts, as the type has D. XIII. 10 and A. III. 5. It may represent a new species, but with only two specimens in hand it is not advisable to give it a new name. The other known species of the genus, *S. guentheri* Boulenger (*Tetraroge guentheri* Boulenger, Proc. Zool. Soc. London 1889, p. 239 = *S. guentheri* Norman, Sci. Rep. John Murray Exp. VII, No. 1, 1939, p. 95) has D. XIII. 11—12 and A. III. 6. It differs from *S. yamanokami* in the size of the mouth, rather more numerous gill rakers, longer dorsal and anal spines, and in the colouring.

2. Family APLOACTIDAE

Compressed. No scales, but skin covered with velvety villi. Head with more or less developed ridges and knob-like spines. Villiform teeth in jaws and on vomer, none on palatines. Origin of dorsal above or slightly before eye. Spinous part of dorsal longer than soft part, the anterior spines generally separated from the following. No pungent anal spines. Ventrals with a spine and less than 4 rays. Gill membranes free. No slit behind the last gill.

Distribution: A few genera from the Indic and West-Pacific.

1. **Sthenopus** Richardson

(Richardson, Zool. Voy. Samarang, Fishes, 1848, p. 10)

Trichopleura Kaup, Arch. Nat. XXIV, I, 1858, p. 331, p. 338.

Oblong, Skin, including that covering the fins, with small slender filaments, either simple or bifid, most conspicuous on the spinous dorsal and on the lateral line, where they are bifid. Origin of dorsal slightly before eye. The three anterior of the XII dorsal spines are close together and separated by a very low membrane from the rest of the fin. No distinct anal spines. Pectorals with a rather broad base, all rays simple and articulated. Ventrals small with a spine and two rays.

Distribution that of the single species known.

Note. For the validity of the name *Sthenopus* see Whitley, quoted below.

1. **Sthenopus mollis** Rich. (Fig. 25, p. 91)

Sthenopus mollis Richardson, Zool. Voy. Samarang, I, 1858, p. 10.
Trichopleura mollis Günther, Cat. Brit. Mus. II, 1860, p. 143.
Sthenopus mollis Whitley, Rec. Austr. Mus. XIX, No. 1, 1933, p. 101.
Trichopleura mollis Herre, Bull. Raffles Mus. No. 16, 1940, p. 48.

D. XI—XII. 8—10. A. 3. 6. or 1. 9. P. 15. V. I. 2.

Height 2.9, 3.45 in length with caudal. Head 2.6, 3.1 in length with caudal. Eye 5.5, equal to convex interorbital space, which is ocupied by the three anterior dorsal spines. Minute villiform teeth in bands in jaws and in a transverse patch on vomer, none on palatines. Mouth almost vertical. All bones of head hidden by the integuments. A narrow plate of bone descends from the chain under the posterior part of the eye to the curve of the preopercle, which is also concealed by skin. Middle spine of the three anterior dorsal spines longest, connected to its neighbours by membrane as high as the tips. The third spine is connected by low membrane to the following spines, the membranes of which are deeply notched, but clothed with thick skin studded with filaments. Soft dorsal higher than the spines. The existence of anal spines is not clearly made out. Pectorals obliquely rounded, as long as head without snout. Ventrals as long as snout. Caudal rounded, with the tips of the rays projecting. Colour of preserved specimens grey, passing on the under surface into pale purplish brown and white. There is a row of spots on the lateral line, and there are some pale dots scattered over the head, flanks, and fins. The fin membranes, particularly the borders of the pectorals, are dark. Length 75 mm (type in the British Museum examined).

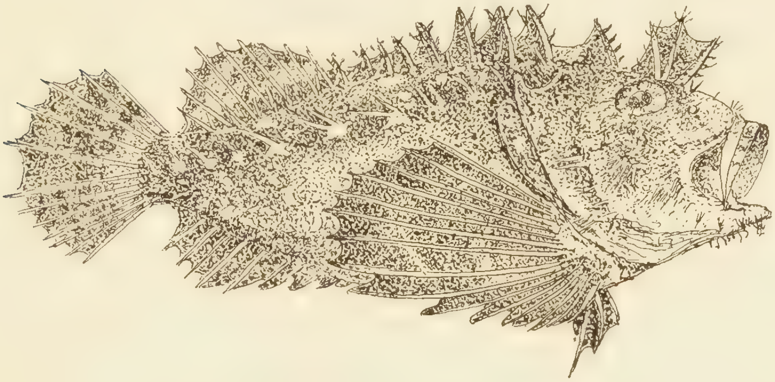

Fig. 25. *Sthcnopus mollis* Rich. After Richardson. × $1^1/_3$ nat. size.

Habitat: Singapore. — China!

3. Family BATHYAPLOACTIDAE

Compressed. No scales. Two pairs of nostrils. Head without spiny ridges above. Preorbital with two blunt spines directed posteriorly, at least the upper one very long. Preopercular ridge with strong, but blunt spines. Villiform teeth in the jaws and generally on vomer, apparently none on palatines. Origin of dorsal on head. Spinous part of dorsal longer than soft part, the anterior spines longer than the posterior ones, and often separated from them by low membranes. No pungent anal spines. Pectorals with simple rays only. Ventrals with a spine and two simple rays. Gill opening a narrow slit near upper part of opercle.

Distribution: Three genera, *Bathyaploactis* from Australia, *Acanthosphex* from China, and *Kleiwegia* from Nias, each, as far as known, with a single species.

1. **Kleiwegia** de Beaufort

(de Beaufort, Copeia 1952, No. 1, p. 45)

Head and body without tubercles or papillae. Lateral line consisting of a small number of elongate tubes, which are not spiny. Preorbital spines of equal length. Villiform teeth in the jaws, none on the palate? Preopercle with 4 spines, the uppermost the longest. Origin of dorsal above eye. Dorsal consisting of XIV spines and 8 rays. Anal with one flexible spine and 8 articulated rays. Last dorsal and anal rays connected with caudal peduncle by membrane. Gill opening restricted to a slit above pectoral.

1. **Kleiwegia dezwaani** (M. Weber & De Bfrt.) (Fig. 26, p. 93)

Cocotropus de Zwaani, M. Weber & de Beaufort, in Kleiweg de Zwaan, „Die Insel Nias bei Sumatra". The Hague, 1915, p. 275.
Kleiwegia de zwaani de Beaufort, Copeia 1952, No. 1, p. 45.

D. XIV. 8. A. 1. 8. P. 9. V. I. 2.

Height 3, 3.7 in length with caudal. Head less than 3, 3.4 in length with caudal. Eye almost 3.5, somewhat more than snout. Interorbital space convex, less than eye. Mouth somewhat oblique. Maxillary reaching to below posterior half of eye. Preorbital spines as long as eye. Suborbital ridge very prominent but without spines. Four slender spines on hindborder of preopercle, the upper most longest and slightly longer than eye. Origin of dorsal above hindborder of eye. First dorsal spine longest, equal to postorbital part of head, following spines gradually decreasing in length to the fourth, which is about as long as eye. Following spines subequal to fourth. Soft dorsal rays longer than posterior part of spinous dorsal, the rays articulated, the longest as long as first dorsal spine. Anal spine shorter than first anal ray, equal to snout and half eye. Caudal slightly rounded. Colour of preserved specimen brownish. Posterior part of soft dorsal, anal, caudal, and pectorals, dark brown. Length of single specimen known 26 mm.

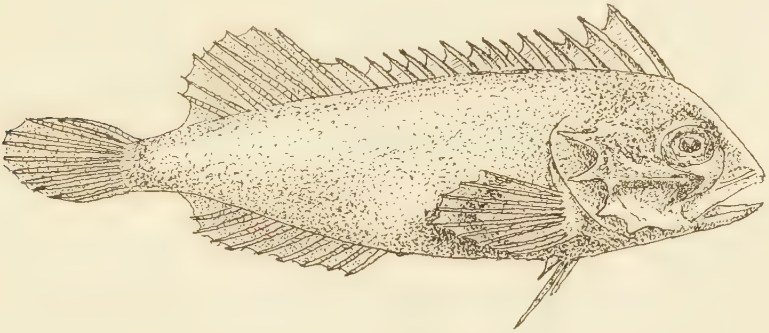

Fig. 26. *Kleiwegia dezwaani* (M. Weber & de Bfrt). × 4 nat. size.

Habitat: Nias!

4. Family SYANCEIDAE

Moderately compressed or more or less depressed. Head generally depressed, eyes often looking upwards. No scales. Small teeth in several rows in the jaws, present or absent on vomer. Palatines edentulous. Origin of dorsal above or scarcely behind eyes. Spinous part of dorsal generally longer than soft part, in one case the numbers of dorsal spines and rays is even. Dorsal and anal spines pungent or flexible. Ventrals adnate to belly, with a spine and 5 rays. Gill membranes attached to isthmus, but the gill opening rather wide.

Distribution: Indic and West-Pacific.

Key to the Indo-Australian genera of Synanceidae

A. No detached pectoral rays.
- a. D. XII-XIII. 6—7. A. III. 6. Spines pungent. Head monstruous, with deep pits. Eyes looking upwards . . . . 1. *Synanceia* p. 94.
- b. D. XVI. 4—5. A. III—IV. 5—6. Spines pungent. Head without deep pits. Eyes looking upwards . . . . 2. *Leptosynanceia* p. 99.

c. D. XII. 12—13. A. II. 13. Spines flexible, those of dorsal scarcely different from the simple rays	3. *Polycaulus* p. 101.
B. Detached pectoral rays.	
a. Two detached pectoral rays. Dorsal with XIV—XVIII spines	4. *Inimicus* p. 103.
b. One free pectoral ray. Dorsal with IX—XII spines	5. *Minous* p. 108.

1. **Synanceia** Bloch Schneider

(*Synanceja* Bloch Schneider, Syst. Ichth. 1801, p. 194)

Synancidium Joh. Müller, Beiträge Kenntniss nat. Fam. Fische. Wiegmann's Arch. Naturgesch. 1843, p. 302.

Synanceichthys Bleeker, Ned. Tijdschr. Dierk. I, 1863, p. 234.

Head large and monstrous, body tapering to tail. No scales, but thick skin, which also covers spines and rays of the fins, with rimples and wattles. Mouth vertical, lower jaw projecting before upper jaw. Villiform bands of teeth in the jaws, present or absent on vomer, none on palatines. Preorbitals flaring out sidewards, suborbitals not in a right line, but more or less bent out sidewards, and hence giving space to a larger or smaller, but always deep groove or pit below the eyes, which are situated above the profile of the head, as the frontals are almost vertical.Eyes looking sidewards. Behind each eye a deep pit, the two being continuous in one species and hence forming a saddle-like deep, transverse depression. No spines on upper part of head. Preopercle with moderate spines,

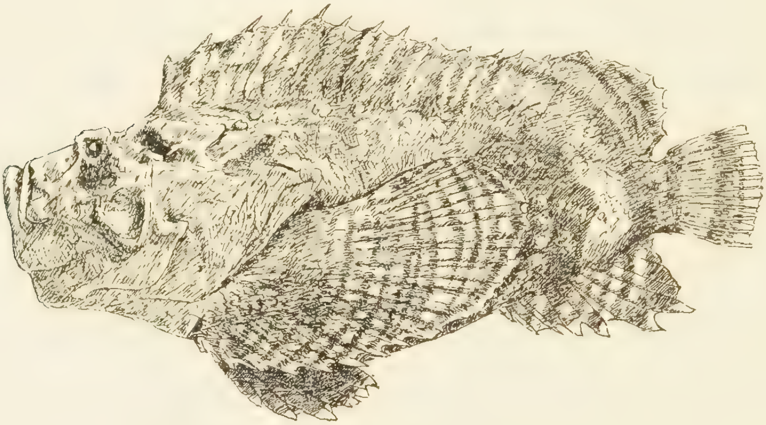

Fig. 27. *Synanceia verrucosa* Bl. Schn. × $^5/_9$.

opercle with or without spines. Dorsal originating above posterior part of head, with XII—XIV spines and 6 or 7 rays. Dorsal spines connected with poison glands. Anal with III short spines and 6 rays. Pectorals with a very long, oblique base. Ventrals with a spine and 5 rays, the last ray attached by a broad membrane to the skin of the belly. Caudal rounded. Gill membranes attached to isthmus, but gill opening wide. A folded membrane, connecting the superior point of the opercle with the body wall forms a kind of tube when the gill opening is closed and hence leaving a narrow communication between the gill cavity and the outside world.

Distribution that of the species described below.

Note. The two species *S. horrida* and *S. verrucosa* are generally placed in two separate genera, on account of the presence of vomerine teeth in *horrida* and on the different features of the head. Bleeker, however, already pointed out that the vomerine teeth may be present or absent in *horrida*, in young specimens as well as in old ones. The difference in the structure of the head is not essential, *horrida* only being an exageration of the grotesque form of the head of *verrucosa*.

Key to the Indo-Australian species of Synanceia

a. A deep transverse saddle-like depression behind eyes, which are elevated, as well as the interorbital space, which is still higher than the eyes. A large, deep groove below eye . . 1. *S. horrida* p. 95.
b. A deep pit on each side behind eyes, separated by an elevated bony area. Interorbital space concave. A small, deep groove below eye. . 2. *S. verrucosa* p. 97.
c. Almost no pit behind eyes. Eyes not much elevated. A large, deep groove below eye. . 3. *S. platyrhynchus* p. 99.

1. **Synanceia horrida** (L.)

Scorpaena horrida Linné, Syst. Nat. 12. Ed., 1766, p. 453.
Scorpaena horrida Bloch, Ausländ. Fische, III. 1787, p. 15.
Synanceja horrida Bloch Schneider, Syst. Ichth. 1801, p. 194.
Synanceia horrida Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 440.
?*Synanceia trachynis* Richardson, Ann. Mag. Nat. Hist. IX, 1842, p. 385.
Synancidium horridum Günther, Cat. Brit. Mus. II, 1860, p. 144.
Synancidium horridum Kner, Novara Exp. Fische I, 1865—1867, p. 119.
Synancidium horridum Day, Fishes of India, Part I, 1875, p. 162.
Synanceia horrida Bleeker, Natuurk. Verh. Holl. Mpij. der Wetensch. 3de Verz. No. 3 (1873) 1874, p. 12. — Atl. Ichth. CCCCXVII. Fig. 7.
?*Synancidium horridum* Macleay, Descr. Cat. Austr. Fish. I, 181, p. 142.

Synancidium horridum Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 297.
Synanceja horrida Whitley, Mem. Queensl. Mus. X, Part I, 1930, p. 24.
?*Synanceja trachynis* Whitley, ibid. p. 25. — Rep. Brit. Mus. (Nat. Hist.) Great Barrier Reef Exp. IV, No. 9, 1932, p. 306.
Synanceia horrida Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 479.

D. XII. 7 or XIII. 6 or XIV. 7. A. III. 6. P. 16. V. I. 5.

Height 2.1—2.6, 2.6—3 in length with caudal. Head 2.1—2.4, 2.5—2.9 in length with caudal. Eye 8.6—13.8, 2.7—3.4 in snout and 1.7—2.4 in interorbital space. Mouth vertical. Villiform bands of teeth in the jaw. A more or less triangular or crescentic patch of small teeth on vomer, sometimes wanting. Lips fringed with small tentacles. Preorbital with two short spines, directed outwards, both covered with thick skin, and the anterior one with a fleshy flap. The suborbitals are not arranged in a straight line but make an angle with each other of about 90 degrees, the top directed outwards. Above them a large, deep groove, bordered above by the almost vertically rising frontal, which forms the upper part of the orbit. The eyes, which are possibly retractile, and look outwards, hence high up, as well as the interorbital space, which rises up still higher. A very deep saddle-like, transverse depression behind eye, hence the eyes look as being stalked. About five spines along edge of preopercle, the hindermost longest, all covered with thick skin. Two diverging ridges on opercle, ending in blunt spines and also covered with thick skin. Origin of dorsal immediately behind the occipital depression, in a vertical line through hindborder of preopercle. The first and second spines close together, diverging. The second is longest, somewhat more than length of snout. The other spines subequal and much shorter than the second one. Soft part of dorsal rounded, the longest rays somewhat longer than longest spines. Anal spines short, the third longest and less than half length of second dorsal spine. Soft anal rounded, much less deep than soft dorsal. All spines and rays of dorsal and anal covered by thick skin. Dorsal and anal rays forked. Base of pectorals long and oblique, the longest rays almost as long as head. Ventral spine as long as first dorsal spine, the last ray broadly attached to skin of belly. Caudal slightly rounded. Body and tail covered with more or less regular rows of fleshy wattles, which also spread on the dorsal. Colour of preserved specimens greyish or reddish brown, sometimes with brick red patches here and there on the body. Length over 300 mm.

Habitat: Singapore; Sumatra (Padang); Bintang; Banka; Biliton; Java (Jacarta!, Pasuruan); Celebes (Makassar); Ternate!;

Buru; Ceram; Ambon; Aru Islands; New Guinea (Manokwari!) — Réunion, coasts of India, Siam, China, Philippines, Australia?, New Hebrides.

Nomen indig. Lepu tembaga or Ikan sétan (Malay). Ikan Tapoi (Pasuruan).

Note. According to Whitley *S. trachynis* differs from *horrida* "in having the nuchal and supratemporal crests larger, the preorbital stay of different architecture, and the anal spines very small and not pungent. There are more wart-like outgrowths on the body and the lower pectoral rays are simple".

2. **Synanceia verrucosa** Bl. Schn. (Fig. 27, p. 94)

Synanceja verrucosa Bloch Schneider, Syst. Ichth., 1801, p. 195.
Scorpaena brachio Lacepède, Hist. Nat. Poissons III, 1802, p. 259, p. 272.
Synanceia brachio Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 447.
Synanceia brachio Bleeker, Verh. Bat. Gen. XXIII, 1849. Bijdr. kennis Scleroparei, p. 9.
Synanceia verrucosa Günther, Cat. Brit. Mus. II, 1860, p. 146.
Synanceichthys verrucosus Bleeker, Ned. Tijdschr. Dierk. I, 1863, p. 234.
Synanceja verrucosa Klunzinger, Verh. zool. bot. Ges. Wien XX, 1870, p. 811.
Synanceia brachio Le Juge, Trans. Roy. Soc. Mauritius V. 5. 1871, p. 19.
Synanceia verrucosa Day, Fishes of India, Part I, 1875, p. 162.
Synanceia verrucosa Bleeker, Verh. Holl. Mpij. der Wetensch. 3de verz. II, No. 3 (1873) 1874, p. 15. — Atl. Ichth. IX, 1879. Tab. CCCCXVII. Fig. 5.
Synanceja verrucosa Klunzinger, Fische des rothen Meeres I, 1884, p. 74.
Synanceia verrucosa Sauvage, Poissons de Madagascar, 1891, p. 382.
Synanceia verrucosa Garman, Bull. Mus. Harvard Coll. XXXIX, No. 8, 1903, p. 232.
Synanceia verrucosa Seale, Occas. Papers B. P. Bishop Mus. IV, 1906, p. 81.
Synanceja verrucosa Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 379.
Synanceja verrucosa Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 297.
Synanceichthys verrucosus Whitley, Rep. Brit. Mus. Great Barrier Reef Exp. IV, No. 9, 1932, p. 309.
Synanceja verrucosa Matsubara, Trans. Segenkagaku Kenkyusyo 2. 1943, p. 425.
Synanceja verrucosa J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed., 1950, p. 374.
Synanceia verrucosa Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 480.

D. XIII. 7. A. III. 6. P. 18—19. V. I. 5.

Height 2.6—2.7, 3—3.2 in length with caudal. Head 2.2—2.4, 2.6—2.8 in length with caudal. Eye 13—13.4, 3.6—3.8 in snout and 4.2—4.4 in interorbital space. Mouth vertical. Villiform teeth in the jaws, none on the palate. Lips fringed with more or less arborescent tentacles. Preorbital with two spines, directed outwards, the anterior one with a fleshy flap. The suborbitals are arranged in a curved line with the convexity outwards. Above them a small but rather deep groove, bordered above by the almost vertically rising frontal, which forms the upper part of the orbit. The eyes, which look outwards, hence somewhat above the upper profile of the head, the interorbital space very concave. A deep pit on each side of the head behind eye, the two separated by an elevated area, and hence without a continuous transverse saddle as in *S. horrida.* A rounded spine at hinder edge of preopercle, followed below by some smaller ones. No ridges or prominent spines on opercle. Origin of dorsal immediately behind the bony area separating the postorbital pits, above or somewhat behind hindborder of preopercle. First dorsal spine equal to snout, third and fourth longest, equal to or more than interiorbital space. Fifth nearly as long as fourth, last spine slightly shorter than fifth. Soft dorsal rounded. Anal spines shorter than dorsal ones, the third spine longest and about equal in length to second dorsal spine. Soft anal rounded, the longest rays not shorter or slightly shorter than those of dorsal, and equal to snout and eye. All spines and rays covered by thick skin. Pectorals rounded, with a long oblique base, the longest rays not much shorter than eye. Ventral spine equal to or longer than third dorsal spine, the last ray broadly attached to skin of belly. Caudal slightly rounded. Skin of body and tail covered with numerous short fleshy tubercles, sides of head with short papillae. Colour of preserved specimens brownish and greyish. A broad, irregular, white, transverse band from base of soft dorsal to that of soft anal. Pink patches may be present, scattered on tail. Dorsal brownish, mottled with darker. An indistinct white band on soft dorsal, which sometimes shows pink patches. Proximal part of caudal brown, rest of fin white, but with a broad, dark brown, subterminal, transverse band. Anal whitish, striped and mottled with brown, tips of rays and spines white. Pectorals whitish with numerous irregular broader or narrower, brown, transverse bands, tips of the rays white. Ventrals brown with transverse rows of white stripes or spots, tips of the rays white. Length over 300 mm.

Nomen indig. Ikan Setan, Matjan (Malay).

Habitat: Singapore; Pulu Weh!; Batu Islands; Bintang; Java (Jacarta, Pasuruan); Celebes (Menado); Karakelang!; Sulu Islands; Saleyer!; Ternate; Halmahera; Ceram; Ambon; Banda; Timor; Waigeu; Mysore; New Guinea. — Coast of Natal, Madagascar, Zanzibar, Mauritius, Réunion, Maldives, Red Sea, coasts of India, Ceylon, Riu Kiu Islands, Formosa, Philippines, Guam, Marshall Islands, New Hannover, Solomon Islands, coasts of Queensland, Rotuma, Fiji, Society Islands.

In sea.

Note. This fish is as much dreaded as *S. horrida.* For pariculars see Le Juge, l.c. and J. L. B. Smith, Copeia 1951, No. 3, p. 207.

3. **Synanceia platyrhynchus** Blkr.

Synanceia platyrhynchus Bleeker, Verh. Holl. Mpij der Wetensch. 3de Verz. II, No. 3 (1873) 1874, p. 14. Atl. Ichth. IX, 1879. Tab. CCCCXVI. Fig. 2.

D. XIII. 7. A. III. 6. P. 17. V. I. 5.

Height 2.5, 2.8 in length with caudal. Head 2.1, 2.3 in length with caudal. Eye 12.1. No. vomerine teeth. I consider this species, which Whitley (Mem. Queensl. Mus. X, Part 1, 1930, p. 24) has placed in a subgenus of its own: *Nofua,* to be a hybrid between *S. horrida* and *S. verrucosa.* I have examined the type in the Leiden Museum and a specimen, without locality, in the Amsterdam Museum. As far as I know no other specimens are known. Both specimens are more like *horrida* than *verrucosa.* The postorbital saddle is less deep than in *horrida,* the orbital sockets are less high. The interorbital space is concave as in *verrucosa,* and the eye sockets are connected behind by a curved, bony ridge, the concavity of which is directed snoutwards. The pit below the eye is larger than in *verrucosa,* and slightly less deep than in *horrida.* Lengths of the two specimens 153 and 220 mm.

Habitat: Ambon!

2. **Leptosynanceia** Bleeker

(Bleeker, Verh. Holl. Mpij der Wetensch. 3de Verz. II, No. 3 (1873) 1874, p. 17)

Head flat above, body tapering to tail. No scales. Skin smooth and not very thick. Mouth vertical. Villiform teeth in the jaws, none on the palate. No deep pits or grooves on head. Eyes looking upwards. Dorsal originating slightly behind gill openings, with XVI spines and 4 or 5 rays. Anal with III or IV spines and 5 or 6 rays. Pectorals with a rather long, oblique base. Ventrals with a spine and 4 (3) rays, the last ray largely attached to the skin of the belly. Caudal slightly rounded. Gill membranes attached to isthmus, but gill opening wide. A folded membrane connects upper end of opercle with body wall in such a way that it forms an open tube, giving communication between the gill cavity and the outer world when the gill openings are closed.

Distribution that of the single species known.

1. **Leptosynanceia asteroblepa** (Rich.) (Fig. 28, p. 101)

Synanceia asteroblepa Richardson, Fishes Voyage Sulphur, 1844, p. 69.
Synanceia asteroblepa Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 419.
Synanceia asteroblepa Günther, Cat. Brit. Mus. II, 1860, p. 147. — Ann. Mag. Nat. Hist. (4) I, 1868, p. 265.
Synanceia asteroblepa Peters, Monatsber. Akad. Wiss. Berlin (1868) 1869, p. 259.
Leptosynanceia asteroblepa Bleeker, Natuurk. Verh. Holl. Mpij der Wetensch. 3de Verz. II, No. 3 (1873) 1874, p. 18. — Atl. Ichth. IX, 1879, Tab. CCCCXVI. Fig. 6.
Leptosynanceia greenmani Fowler, Proc. Acad. Nat. Sci. Philadelphia (2) LVII, 1905, p. 507.
Synanceia asteroblepa Vinciguerra, Ann. Mus. Civ. Genova (3) X, (L), 1926, p. 539.
Leptosynanceia asteroblcpa Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 298.
Leptosynanceia asteroblepa Herre & Myers, Bull. Raffles Mus. XIII, 1937, p. 34.

D. XVI. 4—5. A. III. 5 or IV. 5. P. 14—15. V. I. 4 (I. 3).

Height 3.1—3.6, 3.9—4.6 in length with caudal. Head 2.6—2.8, 3.4—3.6 in length with caudal. Eye 11—13, 2.7—3.2 in flat interorbital space, and 1.8—2.1 in snout. Mouth vertical. Villiform teeth in the jaws, none on the palate. Posterior nostrils in front of eye, anterior nostrils near upper lip, both with a short tube. Upper and lower lips fringed with short tentacles. Two very short and blunt preorbital spines, directed forwards and outwards. Five blunt spines along preopercular edge, increasing in length posteriorly. Two diverging ridges on opercle, ending in a blunt spine. Origin of dorsal slightly behind gill openings. First spine about twice eye, following spines slightly increasing in length, the 12th about equal to interorbital space, the penultimate one two thirds of last one, which is longest. The membranes between the spines incised. Soft part of dorsal rounded, the longest ray much longer than the longest spine, the last ray attached by membrane to the caudal peduncle. First anal spine equal to first dorsal spine, last spine to penultimate dorsal spine. Soft part of anal similar to that of dorsal. Pectoral rays increasing in length posteriorly, the longest almost as long as head. Ventral spines slightly more than interorbital space, second ray much longer than the others, the fin being pointed and equal to postorbital part of head. In one specimen I find on one side 3 instead of 4 rays. Caudal slightly rounded. Caudal rays forked, all other rays simple, but some of the dorsal and anal rays may be slightly forked. Colour of preserved specimens whitish, upper part of head brownish. Back and sides with numerous brown blotches and spots. Spinous dorsal mottled with brown, distal part of soft dorsal and anal with brown blotches between the rays, forming a distinct brown band in young specimens. A similar dark band along outer edge of pectorals, the rest of the fins more or less spotted with brown. Ventrals with brown spots between the rays. Distal half of caudal brown, more or less dissolved into brown spots in adults. Length 230 mm.

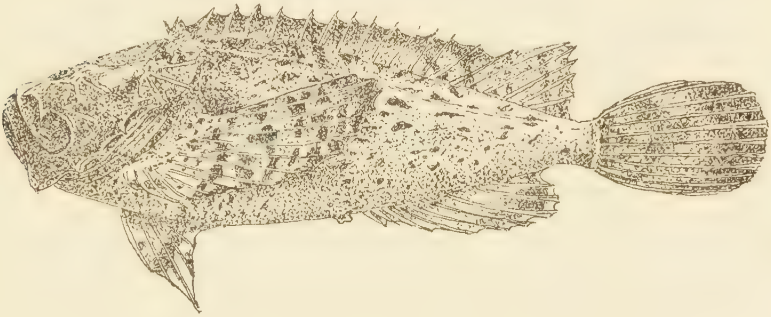

Fig. 28. *Leptosynanceia asteroblepa* (Rich.). × 5/9.

Nomen indig.: Lepu ajoi (Sarawak).

Habitat: Sumatra (Bagan Si Api Api!); Borneo (Pamangkat, Sinkawang, Sungiduri, Baram, Sarawak); New Guinea. — Cochinchina, Annam, Malaya.

In brackish and fresh water, living in mud.

Note. The sting of the spines is considered to be dangerous. The fishermen at Bagan Si Api Api throw these fishes, when caught, immediately over board (Hardenberg, Treubia XIII, 1931. p. 129).

3. **Polycaulus** Günther

(Günther, Cat. Brit. Mus. II, 1860, p. 175)

Trachicephalus Swainson, Nat. Hist. Fishes II, 1839, p. 268 (preoccupied).

Elongate, Naked. Head flattened above, with bony ridges and spines. Eyes directed upwards. Mouth vertical. Villiform teeth in the jaws, palate edentulous. Preopercle armed. Dorsal originating on head, with 24—25 rays, the anterior half consisting of flexible spines and scarcely different from the following simple rays. Anal with II flexible spines and 13 simple rays. Ventrals with a spine and 5 rays, adnate to the skin of the belly. Pectorals without free rays. Gill membranes attached to isthmus, gill opening wide. Vertebrae 10 + 17—18. Lateral line near dorsal profile.

Distribution: that of the single species known.

1. **Polycaulus uranoscopus** (Bl. Schn.) (Fig. 29, p. 103)

Synanceja uranoscopa Bloch, Schneider, Syst. Ichth. 1801, p. 195.
Uranoscopus indicus Kuhl & van Hasselt, apud Cuvier & Valenciennes.
Synanceia elongata Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 456.
Synanceia uranoscopa Cuvier & Valenciennes, ibid. p. 458.
Synanceia breviceps Richardson, Fishes Voyage Sulphur, 1944, p. 71.
Synanceia elongata Bleeker, Verh. Bat. Gen. XXII. Bijdr. kennis Scleroparei, 1849, p. 10.
Synancia elongata Cantor, Journ. Asiat. Soc. Bengal XVIII, Part II, 1850, p. 1029.
Polycaulus elongatus Günther, Cat. Brit. Mus. II, 1860, p. 175.
Polycaulus elongatus Kner, Novara Exp. Fische, 1865—1867, p. 120.
Polycaulus elongatus Bleeker, Verh. Holl. Mpij v. Wetensch. 3de verz. No. 3 (1873) 1874, p. 20. — Atl. Ichth. IX, 1879. Tab. CCCCXV. Fig. 2.
Polycaulis uranoscopus Day, Fishes of India, Part I, 1875, p. 164.
Trachicephalus uranoscopus Rutter, Proc. Acad. Nat. Sci. Philadelphia, 1897, p. 81.
Trachicephalus uranoscopus Fowler, ibid. LXXXI, 1929, p. 613. — Hongkong Naturalist II, 1931, p. 305. — Ibid. VI. Suppl. 1938, p. 36.

D. XII. 12. A. II. 13. P. 14. V. I. 5.

Height 4.2—4.6, 5.5—5.7 in length with caudal. Eye 5.7—6, 1.6 in snout and 1.5—1.6 in concave interorbital space. Maxillary reaching to below anterior border of eye. Preorbital with two spines directed downwards. Peduncle of premaxillaries reaching to between eyes, the median part of the interorbital space hence elevated. Supraorbital ridges conneceted behind eyes by a transverse ridge, from which the parallel superior postorbital ridges originate which are again connected by a transverse bony ridge, they are continued backwards along anterior part of dorsal. Inferior postorbital ridges with complicated spines. Preopercular edge with four spines, opercle with two ridges. Lateral line with about 15 distant pores, the anterior ones with a low bifurcated flap anteriorly, the posterior ones indistinct. Dorsal and anal covered by thick skin, the spines and rays hence difficult to count. Both fins low and connected by membrane to caudal peduncle. Ventrals as long as head, pectorals much longer.

Caudal slightly rounded. Colour of preserved specimens light brown; sides of body and tail with numerous white ocelli, bordered by dark brown, as large as or somewhat larger than eye. Pectorals dark brown with similar ocelli. Dorsal whitish, the posterior half of the fin dark brown, the tips of the rays white. Anal and ventrals dark brown, lighter at base. Caudal dark brown with two incomplete white cross bands which form white blotches on the upper part of the fin. Length 125 mm.

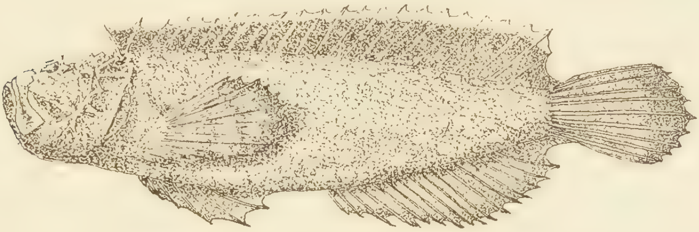

Fig. 29. *Polycaulus uranoscopus* (Bl. Schn.). nat. size.

Habitat: Singapore; Banka; Java (Jakarta!); Borneo (Sandakan); Ambon. — Coasts of India, Siam, Indochina and southern Chine.

Note. Day (l.c.) says that he saw the type of *Synanceja uranoscopa* of Schneider in Berlin and that it is identical with *Synanceia elongata* C. V.

4. **Inimicus** Jordan & Starks

(Jordan & Starks, Proc. U. S. Nat. Mus. XXVII, 1904, p. 158)

Pelor Cuvier, Règne Animal, Ed. II, Vol. II, 1829, p. 168 (preoccupied).

Body elongate, without scales. Head, body and spines often with skinny flaps. Head somewhat depressed, with bony ridges and spines. Eyes on bony sockets which are connected by a transverse, bony plate which forms the hindborder of the deep interorbital space. Mouth almost vertical. Pointed teeth in several rows in the jaws, in one or two patches on vomer, none on palatines. Dorsal originating before gill openings, consisting of XIV—XVIII spines and 7—9 rays. The three anterior spines connected by deeply incised membranes and somewhat separated from the others, which are connected by membrane at base only. Anal with 9—14 rays, the first two or three more or less spine like, the posterior ones forked. Pectorals with a broad base, large, with 10 rays and two lower detached rays, connected by low membrane only to rest of fin. Ventrals with a spine and 5 rays, the fins adnate to the skin of the belly. Caudal rounded.

Distribution: From Madagascar to Japan, New Caledonia and Queensland.

Key to the Indo-Australian species of Inimicus

1. Bony plate connecting eye sockets bent backwards in the middle. D. XVI. 8 (9). Snout longer than postorbital part of head . . 1. *I. didactylus* p. 104.
2. Bony plate connecting eye sockets bent forwards in the middle. D. XVII. 7—8. Snout shorter than postorbital part of head . . 2. *I. brachyrhynchus* p. 106.
3. Bony plate connecting eye sockets straight. D. XVII—XVIII. 8—9. Snout longer than postorbital part of head . . . . 3. *I. cuvieri* p. 107.

1. **Inimicus didactylus** (Pallas) (Fig. 30, p. 105)

Scorpaena didactyla Pallas, Spicil. Zool. VII, 1769, p. 26.
Synanceja didactyla Bloch, Schneider, Syst. Ichth. 1801, p. 195.
Synanceja rubicunda Bloch, Schneider, ibid., p. 196.
Pelor maculatum Cuvier & Valenciennes, Hist. Nat. Hist. Poissons IV, 1829, p. 434.
Pelor obscurum Cuvier & Valenciennes, ibid., p. 436.
Pelor maculatum Lesson, Voyage Coquille, Zoologie, 1830, p. 210.
Pelor obscurum Lesson, ibid., p. 211.
Pelor maculatum Günther, Cat. Brit. Mus.. II, 1860, p. 150.
Pelor didactylum Günther, l.c.
Pelor obscurus Kner, Novara Exp. Fische, 1865—1867, p. 119.
Pelor didactylus Bleeker, Verh. Holl. Mpij. Wetensch. 3de Verz. II, No. 3, 1874, p. 7. — Atl. Ichth. IX, 1879, Tab. CCCCXIV, Fig. 5.
Pelor didactylum Day, Fishes of India, Part I, 1875, p. 160.
Inimicus maculatus Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 379.
Pelor didactylum M. Weber, Siboga Exp. Fische, 1913, p. 497.
Pelor didactylum Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 298.
Inimicus didactylus Matsubara, Trans. Segenkagaku Kenkyusyo 2, 1943, p. 418.
Inimicus didactylus Herre, Notes Fishes Zool. Mus. Stanf. Univ. 1934, p. 66. — Philipp. Journ. Sci. 80, No. 4, 1952, p. 471.

D. XVI. 8 (9). A. II. 11. P. 9 + 2. V. I. 5.

Height 3.4—3.7, 4.3—4.6 in length with caudal. Head 2.9—3.3, 3.6—4.3 in length with caudal. Eye 6.4—7.4, 3.2—4 in snout which is 1.3—1.4 times the length of the postorbital part of the head. Mouth almost vertical. Pointed, somewhat curved teeth in about 6 rows in the jaws and in two patches on vomer. Nostrils much nearer end of snout than eye, the anterior one with a short tube, the posterior one with an elevated rim. Two bony ridges bordering the pedicels of the premaxillaries, united into a median ridge between posterior nostrils, bifurcating again before eyes and running upwards to the bony sockets of the eyes. A deep pit in anterior half of interorbital space, borderd behind by a transverse bony plate which is bent backwards in its median part. Preorbital with two spines, directed downwards, first suborbital with a small spine, last suborbital, forming the preopercular stay, with a spine in its upper posterior part, from which a ridge runs obliquely downwards and forwards, increasing meanwhile in height and forming a loop which in young ones is spine-like. Preopercle with 3 spines, the largest reaching on opercle, with one in front and one behind it. Opercle with a median ridge and a strong spine superiorly. Sides and upper part of head covered by numerous arborescent papillae. Two branched, fleshy tentacles on chin, one behind each maxillary and often smaller ones on the spines of the head. Two flattened spines on the superior postorbital ridges and three similar spines on the inferior postorbital ridges. Area behind eyes a smooth bony plate. Origin of dorsal between the first spines of superior postorbital ridge, the base of the three anterior dorsal spines close together, their connecting membranes deeply incised but more developed than that between the third and fourth spines, and that between the following spines, which are free for their greater part. First and third dorsal spines subequal, shorter than second one which is about as long as snout and eye together, and subequal to the fourth to fourteenth spines; the two last spines shorter and much shorter than the anterior rays of the rounded soft dorsal, which are as long

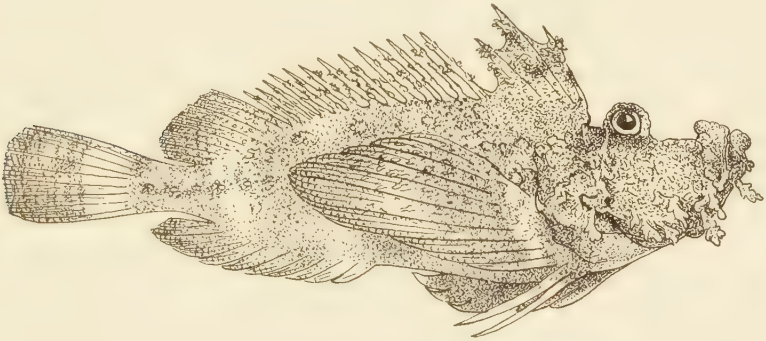

Fig. 30. *Inimicus didactylus* (Pallas). × $^9/_{10}$.

as the longest spines. Last dorsal ray attached by membrane to the short caudal peduncle and the base of the caudal. Anal much less deep than soft dorsal, its spines somewhat more than eye, its longest rays shorter than snout, its last ray connected by membrane to caudal peduncle. The two free pectoral rays connected by membrane at their base; they are subequal and as long as snout or as snout and eye. Pectoral rounded, longer than head. Ventrals horizontal, adnate to the skin of the belly, the fifth and longest ray almost as long as the head. Caudal slightly rounded. Skin of back, sides and most of the fins with arborescent papillae; a series of 14—15 along the lateral line. Colour of preserved specimens variegated lighter and darker brown, in young specimens indications of blackish cross bands on tail. Head more or less whitish. Spinous dorsal whitish, with a dusky blotch on the membrane between the second and third spines. Soft dorsal white with a broad, dark, terminal border. Anal light with a darker patch on each of the spines and rays. Pectorals whitish; their base, a broad median transverse band, and a broad terminal band brown or crimson. Ventrals whitish at base, brown or dark red in their distal part. Caudal white, with a basal and a subterminal dark band, these bands often broken into rows of lines or irregular spots. Length 173 mm.

Habitat: Singapore; Java (Cheribon!); Celebes (Amurang); Batjan; Ceram; Ambon; Nussalaut; Kei Islands!; Waigeu; New Guinea. — Maldives, Andamans, China (Amoy), Philippines, New Britain, New Ireland, Solomons, New Hebrides, New Caledonia, Queensland. In moderate depths, but up to 540 m.

Note. M. Weber (l.c.) says that his specimen was dredged together with Lithothamnion, settled between its branches, and that it was hard to spot on account of its colouring matching that of the algae.

2. **Inimicus brachyrhynchus** (Blkr)

Pelor brachyrhynchus Bleeker, Verh. Holl. Mpij Wetensch. 3de Verz. II, No. 3 (1873) 1874, p. 5. — Atl. Ichth. IX, 1879, Tab. CCCCXIII, Fig. 1.

D. XVII. 7—8. A. II. 9. P. 10 + 2. V. I. 5.

Height 3.3—3.6, 4.3—4.7 in length with caudal. Head 2.9, 3.7 in length with caudal. Eye 6.4—8, 2.1—2.2, in snout which is five sevenths of the postorbital part of the head. Mouth much oblique. Pointed teeth in bands in the jaws and in a single transverse band on the vomer. Nostrils much nearer end of snout than to eye, both with a short tube. Two bony ridges, bordering the pedicels of the premaxillaries, united before it and again bifurcating, ending at the base of the bony eye sockets. Interorbital space a deep pit, borderd behind by a bony transverse ridge, connecting the eye sockets; the upper edge of this ridge bent forwards. Preorbital with two spines, directed outwards. Suborbitals with 3 spines. A blunt spine at preopercular edge, provided with a fleshy arborescent tentacle. About six similar tentacles in a row on preopercular lower border. Similar tentacles on chin. Superior postorbital ridges without spines, inferior postorbital ridges with one or two blunt spines. Origin of dorsal above hindborder of preopercle. The first and second dorsal spines diverging, their base close together. The first two thirds length of second, which is subequal to the following spines, and as long as snout and eye. The membranes between the spines very deeply incised. Soft dorsal truncate behind, the rays rapidly decreasing in length posteriorly, the first about as long as spines, the last less than half the length of the first, and attached by membrane to the caudal peduncle, almost at base of caudal. Anal spines short, as long as eye, anterior rays slightly longer, the 6th, 7th, and 8th rays much longer and equal to postorbital part of head. The two free pectoral rays connected with each other in their basal half and connected to rest of fin by a low membrane. Anterior free ray longer than head without snout, posterior one as long as snout and eye. Pectorals rounded, longer than head. Ventrals adnate to skin of belly, the fifth and longest ray longer than head without snout. Caudal rounded. Body and tail with small arborescent papillae, about 13 in a row along lateral line. Colour of preserved specimens greyish, with dark brown dots on sides of body and tail, pectorals, and caudal. Length 222 mm (type in Leiden Museum examined).

Habitat: Singapore!

Note. Bleeker described this species after a specimen of 180 mm length from Singapore. In the old collection of the Amsterdam Museum I found another, larger specimen, without locality but most probably from Indonesia.

3. **Inimicus cuvieri** (Gray)

Pelor cuvieri Gray, Illustr. Indian Zool. II, 1832—1834, Pl. 20, fig. 2.

Pelor Cuvieri Richardson, Fishes, Voyage Sulphur, 1844, p. 72. — Rep. 15th meeting Br. Ass. 1845, 1846, p. 212.

Pelor Cuvieri Bleeker, Nat. Tijdschr. Ned. Indië IV, 1853, p. 252.

Pelor cuvieri Günther, Cat. Brit. Mus. II, 1860, p. 150.

Pelor cuvieri Bleeker, Verh. Holl. Mpij Wetensch. 3de Verz. II. No. 3, 1874, p. 8. — Atl. Ichth. IX, 1879. Tab. CCCCXVI. Fig. 3.

Inimicus cuvieri Fowler, Hongkong Nat. II, 1931, p. 305.
Inimicus cuvieri Herre, Philipp. Journ. 80, No. 4, 1952, p. 469.

D. XVII. 8—9 or XVIII. 9. A. 13—14. P. 1. 8. 2 + 2. V. I. 5. Height 3.2—3.6, 4—4.5 in length with caudal. Head 2.7—3.2, 3.4—4.1 in length with caudal. Eye 7.3—8.6, 2.2—2.4 in interorbital space, 3.5—4.1 in snout which is longer than postorbital part of head. Mouth almost vertical. Pointed teeth in several rows in the jaws and on vomer in two patches connected by a narrow stripe of teeth which may be interrupted in the middle. Nostrils much nearer end of snout than eye, both with a low rim. Two bony ridges on each side of premaxillaries pedicels, meeting in front of it and then diverging again, running to elevated bony sockets of eyes. The deep interorbital space bordered behind by a straight transverse bony plate, connecting the eye sockets. Preorbital with two spines, a shorter one directed downwards and forwards and a large one directed downwards and backwards. A pointed spine at preopercular edge. Tufted tentacles on chin and along preopercular border. Origin of dorsal slightly behind hindborder of preopercle. First and second dorsal spines close together at base, diverging. The first spine two thirds of second one, which is slightly shorter than or equal to third spine. Fourth spine longest and as long as snout and half eye; last spine about as long as first one. Soft dorsal slightly rounded. Anal spines about twice eye, rays increasing in length posteriorly. Dorsal rays and posterior anal rays forked. Pectorals as long as head, the upper free ray about as long as snout and eye, the lower one shorter or longer. Ventrals adnate to belly, the fifth ray longest, as long as head without snout. Caudal rounded. Colour of preserved specimens brownish, pectorals blackish. Length 222 mm (Type in the British Museum and specimens of Bleeker's collection in the Leiden Museum examined).

Habitat: Singapore; Sumatra (Priaman!). — Philippines, China!

5. **Minous** Cuvier & Valenciennes

(Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 420)

Corythobatus Cantor, Journ. Asiatic Soc. Bengal XVIII, 1950, p. 1027.

Body elongate, without scales, smooth. Head more or less compressed, with bony ridges and spines, lastnamed numerous and tubercle-like. Mouth more or less oblique. Villiform teeth in jaws and in one or two patches on vomer, none on palatines. Dorsal originating above gill openings, consisting of IX—XII spines and

10—12 simple rays. Anal with 9—13 rays, the two anterior ones more or less spiny, the fin covered by thick skin. Pectorals with 11 rays and one lower detached ray. Ventrals with a spine and 5 rays, adnate to the belly, Caudal truncate or feebly rounded.

Distribution: Indic and Pacific, north to Japan and east to Australia. In sea.

Key to the Indo-Australian species of Minous

A. First dorsal spine much shorter than the second spine.
  a. Two to four small tentacles on upper part of eye. A. 9 . . . . 1. *M. trachycephalus* p. 109.
  b. No tentacles on eye. A. 13 . . . . 2. *M. pictus* p. 111.
B. First dorsal spine as long or almost as long as second spine.
  a. Height 2.5—3. Height of head 1.3—1.4 in its length . . . . 3. *M. monodactylus* p. 111.
  b. Height 3.5—3.7. Height of head 1.4—1.45 in its length . . . . 4. *M. oxycephalus* p. 113.

1. **Minous trachycephalus** (Blkr.)

Aploactis trachycephalus Bleeker, Nat. Tijdschr. Ned. Indië VII, 1854, p. 451.
Minous trachycephalus Günther, Cat. Brit. Mus. II, 1860, p. 149.
Corythobatus trachycephalus Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 286.
Minous trachycephalus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mém. Scorpénoides, p. 62. Atl. Ichth. Tab. CCCCXV. Fig. 4.
Minous superciliosus Gilchrist & Thompson, Ann. S. Afric. Mus. VI, part 2, 1908, p. 177.
Minous trachycephalus Fowler & Bean, Proc. U. S. Nat. Mus. LXII, Art. 2, p. 63.
Minous superciliosus Barnard, Ann. S. Afric. Mus. XXI, part 2, 1927, p. 921.
Minous superciliosus Fowler, Proc. Acad. Nat. Sci. Philadelphia LXXX, 1934, p. 486.
Minous trachycephalus Matsubara, Trans. Segenkagaku Kenkyusyo 2. 1943, p. 405.
Minous trachycephalus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950, p. 375.
Minous trachycephalus Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 477.

D. X. 11—12. A. 9. P. 11 + 1. V. I. 5.

Height 2.7—2.9, 3.6—3.8 in length with caudal. Head 2.3—2.5, 3—3.3 in length with caudal. Eye 3.6—3.7, 1.3—1.6 in snout and more than concave interorbital space. Mouth slightly oblique, the lower jaw prominent. Maxillary reaching to below frontborder of eye. Villiform teeth in jaws and on vomer in a slightly curved transverse band, narrow in the middle and rounded at both ends.

Supraorbital ridge denticulated. A strong preorbital spine, directed backwards, a small spine in front of it. Each ramus of lower jaw with two short tentacles and according to Bleeker with some minute tentacles anteriorly. A row of 2—4 small tentacles on eye, immediately above pupil. Suborbital ridge rather broad and covered with granular or more pointed spines or tubercles. A spine, less than eye, on hindborder of preopercle, where it joins the suborbital ridge; a small spine, directed upwards, above it, about 3 spines below it. Origin of dorsal slightly behind hindborder of preopercle. First dorsal spine small, about half diameter of eye. Second spine slightly more than diameter of eye. Longest dorsal rays less than snout. Anal spines and rays covered by thick skin. Dorsal and anal connected by membranes to caudal peduncle. Pectorals as long as head. Ventrals adnate to the belly, as long as eye and snout. Caudal slightly rounded. Colour of the examined preserved specimens faded. According to Bleeker back and sides with dark cloudy patches. Spinous dorsal with a dark terminal band, soft dorsal with 2 or 3 oblique dark bands. Length 105 mm. (Specimens of Bleeker's collection examined).

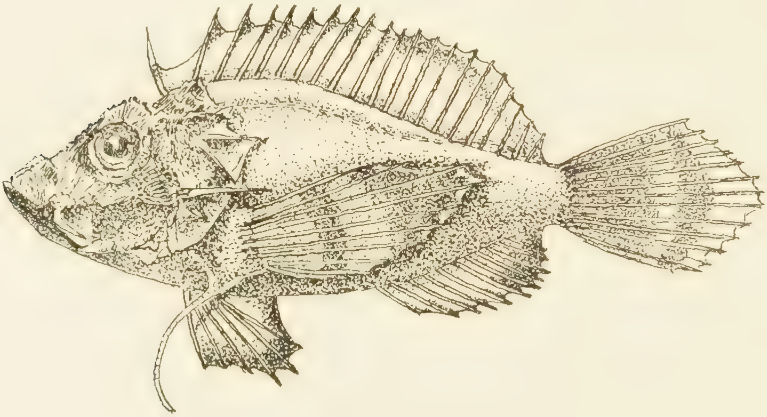

Fig. 31. *Minous monodactylus* (Bl. Schn.) × $1^2/_3$.

Habitat: Nias; Celebes (Menado); Ambon. — Coasts of Natal and Zululand, off Malabar coast, Formosa, Philippines.

Note. J. L. B. Smith (l.c.) united *M. superciliosus* with *M. trachycephalus*. Barnard (l.c.) already supposed that the two species are identical.

2. **Minous pictus** Gthr.

Minous pictus Günther, Zool. Challenger exp. VI, 1880, p. 41.
Minous pictus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 299.

D. XI. 11. A. 13. P. 11 + 1. V. I. 5.

Height 2.6, 3.3 in length with caudal. Head 2.4, 3 in length with caudal. Eye 4.2, 1.4 in snout and slightly more than concave interorbital space. Mouth slightly oblique. Maxillary reaching to below frontmargin of eye. A few rows of small teeth in jaws and in a transverse row on vomer. Supraorbital ridge with a few spines. Suborbital ridge finely denticulated. Two preorbital spines, the anterior one small and directed downwards and forwards, the posterior one as long as the preopercular spine and three fifths of eye. A tentacle on lower jaw, before corner of mouth. Origin of dorsal above hindborder of preopercle; first dorsal spine minute. The three anterior spines a little remote from the remainder of the fin. Second dorsal spine somewhat more than snout. Longest dorsal ray equal to head without snout. Pectorals almost as long as head. Ventrals as long as head without snout. Caudal slightly rounded. Back and dorsal with large brown vertical bands, anastomozing on back below soft dorsal. A black blotch between anterior dorsal spines. Anal with a broad dark border. Pectorals dark. Distal part of ventrals dark. Length 63 mm (Type of the species in the British Museum examined).

Habitat: Arafura Sea!

3. **Minous monodactylus** (Bl. Schn.) (Fig. 31, p. 110)

Scorpaena monodactyla Bloch, Schneider, Syst. Ichth. 1801, p. 194.
Apistus minous Cuvier, Règne Animal, Ed. II, 1828, p.
Minous woora Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 421.
Minous monodactylus Cuvier & Valenciennes, ibid. p. 424.
Minous monodactylus Bleeker, Verh. Bat. Gen. XXII. 1849. Bijdr. Scleroparei, p. 9.
Corythobatus woora Cantor, Journ. Asiat. Soc. Bengal XVIII, part II (1849) 1850, p. 1027.
Minous monodactylus Günther, Cat. Brit. Mus. II, 1860, p. 148.
Corythobatus monodactylus Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 286.
Minous monodactylus Day, Fishes of India, Part I, 1875, p. 159.
Minous monodactylus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876, Mémoire Scorpénoides, p. 63. Atl. Ichth. IX, 1879, Tab. CCCCXII, Fig. 2.
Minous monodactylus Machan, Ann. Naturh. Mus. Wien XLIV, 1930, p. 437.
Minous monodactylus Tortonese, Boll. Mus. Zool. Anat. Comp. Torino XLV. 1935—1936, Ser. III, no. 63, p. 53.
Minous monodactylus Fowler, Hongkong Nat. 6. Suppl. 1938, p. 36.

Minous monodactylus Matsubara, Trans. Segenkagaku Kenkyusyo 2, 1943, p. 401.
Minous monodactylus Blegvad, Danish Sci. Inv. Iran. Part III, 1944, p. 191.
Minous monodactylus Munro, The marine and fresh water fishes of Ceylon. 1955, p. 251.

D. IX. 11—12 or X. 10 or XI. 10 A. 10—11. P. 10—11 + 1. V. I. 5.

Height 2.5—3, 3.5—4 in length with caudal. Head 2.2—2.3, 3 in length with caudal, its depth 1.3—1.4 in its length. Eye 3.7—4.4, 1.2—1.3 in snout and equal to or somewhat more than concave interorbital space. Mouth oblique, maxillary reaching to below frontborder of eye. Villiform teeth in narrow bands in jaws and in a curved transverse band on vomer. Anterior nostril with a short tube, posterior nostril with a low rim. Anterior orbital rim elevated, with 4 or 5 fan like, diverging ridges ending in blunt spines, the inner one of these ridges continued as supraorbital ridge which has a number of blunt spines, increasing in length posteriorly. Two low parallel longitudinal ridges on interorbital space, continued as superior postorbital ridges which enclose a pit behind eyes in their anterior part, ending in a compressed spine behind origin of dorsal. Inferior postorbital ridge with three large recumbent spines, each of which bears a number of small spinules. Preorbital with a short blunt spine directed downwards and backwards. Suborbital ridge denticulated, ending posteriorly in a number of fan like diverging ridges; one of these ending above the preopercular spine which is longer than the long preorbital one, and another ridge ending in the smaller spine on preopercular border below the main spine. Three more small spines on lower preopercular border. A short tentacle on lower jaw before corner of mouth. Two diverging ridges on opercle. Origin of dorsal behind hindborder of preopercle. First and second dorsal spines diverging, of equal size and as long as snout. Following spines slightly increasing in length, the longest half eye longer than the first. Anterior dorsal rays the longest, almost equal to snout and eye. Anal lower than soft dorsal, both fins rounded, their rays simple. Pectorals slightly longer than head, the detached ray as long as snout and eye. Ventrals about as long as head without snout. Caudal rounded. About 16 tubes in the lateral line, the 6 or 7 anterior ones free posteriorly, forming small tentacles. Lateral line running high, posteriorly along base of soft dorsal. Colour of preserved specimens yellowish, lighter below, with broad, brown, longitudinal bands running from head to caudal, converging to upper half of base of that fin. Tips of dorsal spines dark, soft dorsal with a dark blotch anteriorly and sometimes others on rest of fin. Anal with a dark border. Caudal with indications of dark transverse bands. Pectorals and ventrals dark, especially in their outer halves. Length 85 mm. (Specimens of Bleeker's collection examined).

Habitat: Singapore; Sumatra (Priaman); Banka; Java (Jakarta, Japara, Cheribon); Borneo; Celebes (Makassar!). — Red Sea, Mauritius, Maldives, Iranian Gulf, coasts of India, Ceylon, Annam, Malaya, China.

4. **Minous oxycephalus** Blkr

Minous woora Bleeker, Nat. Tijdschr. Ned. Indië IV, 1853, p. 251 (nec. C. V.).
Corythobatus monodactylus Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 286 (nec. Bl. Schn.).
Minous oxycephalus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mémoire Scorpénoïdes, p. 65.
Minous oxyrhynchus Bleeker, Atl. Ichth. IX, 1879. Tab. CCCCXVII. Fig. 4 (errore).

D. X. 10—11. A. 9. P. 11 + 1. V. I. 5.

Height 3.5—3.7, 4.4—4.7 in length with caudal. Head 2.4—2.5, 3—3.2 in length with caudal, its depth 1.4—1.45 in its length. Eye 3.5—4.4, 1.1—1.5 in snout and somewhat more or less than concave interorbital space. Mouth somewhat oblique, the lower jaw prominent. Maxillary reaching to below frontborder of eye. Villiform teeth in jaws, in a narrow, transverse, curved stripe on vomer. Bones of head granulated. A strong preorbital spine, as long as vertical diameter of eye, directed backwards. A small spine, directed downwards, before it. Preopercular spine longer than longest preorbital spine; one spine above and two spines below it on hindborder of preopercle. Superior and inferior postorbital ridges ending in blunt spines. Opercle with two diverging ridges. Each ramus of lower jaw with two tentacles. Origin of dorsal slightly behind hindborder of preopercle. First and second dorsal spines of equal length and as long as snout, fourth spine somewhat longer. Longest dorsal rays much longer than anal rays, which are covered by thick skin. Pectorals about as long as head. Ventrals about as long as snout and eye. Caudal truncate. Colour of preserved specimens faded. According to Bleeker body and dorsal fin clouded with brown, outer half of pectorals, ventrals, and anal brown. Caudal with several transverse, brown bands. Length 90 mm. (Description made after specimens of Bleeker's collection in the Leiden Museum).

Habitat: Sumatra (Padang, Priaman); Ambon.

5. Family TRIGLIDAE

Moderately compressed, sometimes depressed. Head naked, covered with bony plates, deeper than body which is either scaled or covered with bony plates. Spinous part of dorsal shorter than soft part. Anal with one or without pungent spines. Ventrals with a spine and 5 rays. Two or three of the lower pectoral rays free, more or less rod like. Gillmembranes free from isthmus and from each other. Vertebrae 25—39.

Key to the Indo-Australian genera of Triglidae

A. Body scaly. Two dorsals. Three free pectoral rays. Villiform teeth in jaws and on vomer.
  a. Ll. more than 70 . . . . 1. *Trigla* p. 114.
  b. Ll. less than 70 . . . . 2. *Lepidotrigla* p. 116.
B. Body covered with bony scutes. One or two dorsals. Two free pectoral rays. No teeth in lower jaw and on vomer.
  a. Upper jaw with villiform teeth . . . . . . 3. *Gargariscus* p. 118.
  b. Both jaws toothless . . . . 4. *Peristedion* p. 120.

1. **Trigla** Linné

(Linné, Syst. Naturae. Ed. X. Vol. I, 1758, p. 300)

Elongate, more or less fusiform. Head externally with bony plates, often ending into spines. Eyes high up. Mouth moderately large. Villiform teeth in jaws and on vomer, none on palatines. Scales small or very small, more than 70 in the lateral line, the scales of which are sometimes larger. Two dorsals, the first with VII—XI spines, the second with 11—19 rays. No anal spine. Anal about as long as second dorsal. The dorsals and anal can be lowered into median grooves, those of dorsals often bordered by bony plates. Pectorals long, the three lower rays free. Ventrals with a spine and 5 rays. Caudal more or less forked.

Distribution: Atlantic, Indic, and West Pacific.

Key to the Indo-Australian species of Trigla

a. Preopercular spine short . . . . 1. *T. leptacanthus* p. 114.
b. Preopercular spine long, surpassing gill opening. 2. *T. brandesi* p. 115.

1. **Trigla leptacanthus** Gthr (Fig. 32, p. 115)

Trigla leptacanthus Günther, Zool. Challenger Exp. VI, 1880, p. 42.
Bovitrigla triacanthus 1) Fowler, Proc. U. S. Nat. Mus. LXXXV, 1938, p. 113.
Pterygotrigla leptacanthus (Günther) (British Museum).

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1) Misprint for *leptacanthus*.

D¹. VIII. D². 11. A. 12. P. 1. 11. 4 + 3. V. I. 5.

Height 4.1—4.3, 5—5.4 in length with caudal. Head 2.5, 3 in length with caudal, and without the preorbital spine 2.6—2.8, 3.3—3.5 in length with caudal. Eye 3.3—3.6 in head without rostrum, equal to the concave interorbital space. Mouth slightly oblique, maxillary scarcely reaching to below frontborder of eye. Villiform teeth in jaws and in a rounded patch on vomer. Preorbital spine directed forward, longer than eye, the suprascapular spine about as long as eye. Preopercular spine very short. Longest dorsal spine equal to snout (without preorbital spine) and half eye. Second dorsal less high than first dorsal, the posterior rays forked. Anal less deep than second dorsal, all rays simple. Pectorals longer than head without preorbital spine, eleven of its rays forked. Ventrals as long as head without snout. Caudal forked. About 120 scales between head and caudal. Lateral line not spiny. No scutes along base of dorsal. Colour light reddish; back and base of the second dorsal with scattered irregular blue ocelli. A bluish streak below the canthus rostralis. Posterior surface of the pectorals blue with a white margin all round, and a large black spot at the base. Length 116 mm. (Type of the species in the British Museum examined).

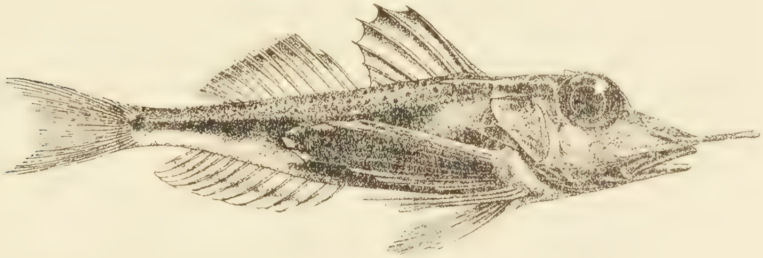

Fig. 32. *Trigla leptacanthus* Gthr. After Günther.

Habitat: Kei Islands, 232 m!

2. **Trigla brandesi** Blkr

Trigla Brandesi Bleeker, Nat. Tijdschr. Ned. Indië I, 1850, p. 24. — Ibid. II, 1851, p. 226.

D¹. IX. D². 1. 12?. A. ?. P. 1. 10 + 3. V. I. 5.

Height about 6.5. Head a little more than 2, forked anteriorly. Orbits and vertex without spines. Rostro-frontal profile very concave. Eye 4. Suborbitals without spines, the anterior ones reaching one eye diameter beyond rostrum, divergent, and twice as long as broad. Two nasal and two opercular spines, one stout preopercular spine, surpassing gill opening. Scales of sides small. Second to fourth stout dorsal spines longer than the others, less than depth of body. Pectorals broad and wing like (incomplete), caudal truncate. Head and body bright red. Colour of fins?. Length 360 mm. (After Bleeker).

Habitat: Banda Neira.

Note. Nothing is known about this species but Bleeker's short description. In the second paper quoted the species is only mentioned in a list of Banda fishes. As can be judged from the description, the only specimen was in a rather bad state when first examined by Bleeker. It seems to have been lost afterwards, as it does not occur in the catalogue of the sale of Bleeker's collection, and no other specimens have been recorded. It may as well be a *Trigla* as a *Lepidotrigla,* although Bleeker's statement: "squamis lateribus parvis" points to *Trigla.*

2. **Lepidotrigla** Günther

(Günther, Cat. Brit. Mus. II, 1860, p. 90, p. 196)

Elongate, more or less fusiform. Head externally bony, the bony plates with radiating granulated ridges, often ending into spines. Eyes high up. Mouth moderately large. Villiform teeth in jaws and on vomer, none on palatines. Scales of moderate size, never minute. A row of spiny scales or plates forming a low sheath of both dorsals. Lateral line unarmed, its scales not or scarcely enlarged, with diverging sensory tubes. Two dorsals, the first consisting of VIII or IX spines, the second of 15—17 rays. No anal spine. Anal about as long as second dorsal. Pectorals long, the three lower rays detached, fleshy. Ventrals with a spine and 5 rays. Caudal truncate or slightly emarginate.

Distribution: Indic and western Pacific, eastwards to Australia, northwards to Japan.

Note. This genus differs from *Trigla* only by having smaller scales and is hardly worth generic rank.

1. **Lepidotrigla spiloptera** Gthr (Fig. 33, p. 117)

?*Trigla alata* Houttuyn, Verh. Holl. Mpij Wetensch. XX, deel 2, 1782, p. 320.
Lepidotrigla spiloptera Günther, Challenger Exp. Zool. I, part VI, 1880, p. 42. — ibid. XXII, 1887, p. 64.

Lepidotrigla spiloptera Alcock, Descr. Cat. Indian Deep-Sea Fishes, 1899, p. 67.

Trigla spiloptera Goode & Bean, Oceanic Ichthyol. 1895, p. 463.

Lepidotrigla spiloptera M. Weber, Siboga Exp. Fische, 1913, p. 511.

?*Lepidotrigla alata* Herre, Journ. P. Pac. Res. Inst. VIII, 1933, p. 5.

?*Lepidotrigla multispinosus* J. L. B. Smith, Trans. Royal Soc. S. Africa XXII, Part IV, 1934, p. 326.

Lepidotrigla punctipectoralis Fowler, Proc. U. S. Nat. Mus. LXXXV, 1938, p. 107.

Lepidotrigla spiloptera Norman, John Murray Exp. 1933—1934. Sci. Rep. VII, No. 1, 1939, p. 96.

?*Lepidotrigla multispinosus* J. L. B. Smith, The Sea Fishes of S. Africa. 2nd ed. 1950, p. 382.

Lepidotrigla spiloptera Herre & Kaufman, Proc. Biol. Soc. Washington 65, 1952, p. 29.

D^1. IX. D^2. 15—17. A. 15—16. P. 11 + 3. V. I. 5. Ll. 62—66.

Ltr. $\begin{array}{c} 3\text{-}4 \\ \hline 1 \\ \hline 14\text{-}15 \end{array}$.

Height 3.5—4.4, 4.3—5.4 in length with caudal. Head 2.7—3. 3.3—3.6 in length with caudal. Eye 3.3—3.9, 1.5—1.9 in snout. Interorbital space concave, 1.2—1.6 in eye. Mouth almost horizontal. Maxillary reaching to below frontborder of eye in large specimens, not so far in young ones. Villiform teeth in rather narrow bands in the jaws and in a narrow band on vomer. No palatine teeth. Preorbitals produced beyond upper jaw, in young ones with a large horizontal spine at their end, followed by about 12 spines gradually decreasing in length to the median line and with a great number of minute spines along their lower border. In old specimens the large spines get blunter and the upper profile of the preorbital process is therefore less pointed. Nostrils at some distance from each other,

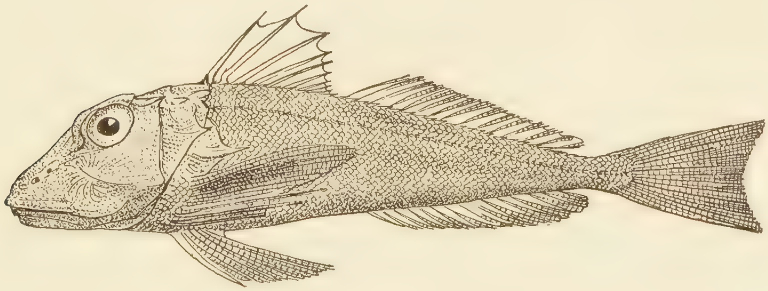

Fig. 33. *Lepidotrigla spiloptera* Gthr. × 5/9 nat. size.

the posterior one with a short tube. Supraorbital ridge with two blunt spines anteriorly and another one at the end, followed by a transverse groove which is indistinct in very large specimens. Superior postorbital ridge with a number of minute spines and a larger blunt spine at the end, inferior postorbital ridge with a number of minute spines, better developed in old than in young specimens, interrupted in the middle and with a large blunt spine at the posterior end of both parts. Suborbital ridge poorly developed, serrated or granulated, ending in a short spine at preopercular edge; this spine indistinct in large specimens. A well developed flat opercular spine, and a long and pointed humeral spine. Origin of first dorsal slightly behind gill opening. Frontborder of first spine and upper part of frontborder of second spine serrated. Second spine longest, about equal to half length of head. Last dorsal spine minute. Anterior rays of second dorsal about as long as fifth dorsal spine, the following rays slightly decreasing in length to the last. Anal somewhat lower than second dorsal, the anterior rays as long as sixth dorsal spine. Median pectoral rays branched, the others simple. Pectorals almost as long as head or shorter, well reaching on anal. The first of the three free rays longer than the second, the third shortest. Ventrals as long as snout and eye. Caudal truncate. Scales of back ctenoid, those of sides and belly cycloid. Throat and breast without scales. About 6 or 7 rows of scales before origin of dorsal. Colour of preserved specimens reddish brown on head and back, silvery below. Fins light yellowish. Membrane of pectorals bluish grey with white spots. Length 185 mm.

Habitat: Near Sulu Islands, 290 m!; Borneo (Sandakan)?; Timor Sea, 216 m!; Arafura Sea, 90—304 m!; off Kei Islands, 252 m. — Natal? Zanzibar area, 183—194 m, Arabian Sea, Bay of Bengal, 32—130 m, Philippines, Manila Bay 54 m.

Note. Herre l.c. recorded *L. alata* from Borneo. It is quite possible that *spiloptera* is a synonym of *alata*; lastnamed species ranges from Japan and China to Queensland.

3. **Gargariscus** H. M. Smith

(H. M. Smith, Proc. Biol. Soc. Washington, 1917, p. 145)

Head, body, and tail covered by bony plates and scutes, with exception of chin and breast, which are naked. The anterior ventral plate deeply emarginated anteriorly. Upper profile of head rounded anteriorly, the preorbitals being greatly flattened and provided with a short flat process which projects but little before the anterior profile. A band of villiform teeth in the upper jaw, lower jaw toothless. Two dorsals, the first with VI or VII flexible spines, the second with 15 rays. Pectorals with 2 free rays. Ventrals with a spine and 5 rays.

Distribution: that of the single species known.

1. **Gargariscus prionocephalus** (Duméril) (Fig. 34, p. 119)

Peristethidion prionocephalum Duméril, Nouv. Arch. Muséum IV, 1868, p. 115.
Peristethidion prionocephalum Meyer, Ann. Mag. Nat. Hist. (4) 15, 1875, p. 371.
Peristedion undulatum M. Weber, Siboga Exp. Fische, 1913, p. 513.
Gargariscus semidentatus H. M. Smith, Proc. biol. Soc. Washington 1917, p. 145.
Gargariscus prionocephalus Fowler, Proc. U. S. Nat. Mus. LXXXV, 1938, p. 121.

D. VII. 1. 13. 1 or VI. 1. 14. A. 13—14. P. 12—13 + 2. V. I. 5.

Greatest height between eyes, 4.6, 5.1 in length with caudal. Head 2.2, 2.5 in length with caudal. Eye 5.2—6.5, about equal to concave interorbital space and 2.7 in snout. A band of villiform teeth in the upper jaw, lower jaw toothless. Several rows of simple tentacles along lower lip and below maxillary. Two fleshy tentacles, to the basal half of which simple tentacles are attached, on lower lip, each half way between symphysis of lower jaw and corner of mouth and reaching on ventrals. Preorbitals greatly flattened, rough with radiating rows of small granulations; the rostral horns flat, rounded anteriorly. Suborbital ridge much expanded sideways, in one horizontal line with the outer borders of the preorbitals which are scalloped. A long granulated preopercular spine, reaching on pectorals. A granular ridge ending in a point on opercle. A median spine before eyes, from which two diverging granulated ridges run anteriorly each to a group of two or three spines. Orbital ridges granulated. Superior postorbital ridges with two granulated spines in line with the granulated spines on each of the 24 dorsal scutes,

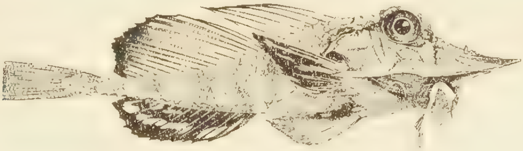

Fig. 34. *Gargariscus prionocephalus* (Duméril) × 1/4.

the last one directed backwards and reaching on caudal rays. Inferior postorbital ridges with a few granulated spines; immediately below the posterior one the first of the denticulated spines of the 29 lateral scutes; the anterior three of these scutes are small, the following are much deeper than long, less so posteriorly; the spine on last scute directed backwards and reaching on base of caudal fin. The line of lateral spines has a sharp bent downwards anteriorly and is horizontal from the seventh to the last one. The first of the dorsal scutes before origin of dorsal and forming one median scute with that of the other side. Chin and breast naked. Ventral bony plates beginning between origin of ventrals. Two median ventral plates, the anterior one deeply emarginated anteriorly. Two longitudinal granulated ridges on both sides of this emargination, continued on posterior ventral plate, which ends before origin of anal and is pierced posteriorly by the anus and the genital papilla. Space below pectorals naked, the sublateral scutes beginning at vertical through anus; the first one situated between lateral scutes and the posterior ventral plate. Twenty sublateral plates in all, all provided with a more or less granulated spine, that of the last scute directed backwards and reaching on base of caudal. Below the sublateral row of scutes a row of 14 scutes along base of anal. Origin of dorsal above posterior border of opercle. Spines flexible, the fourth and fifth longest and equal to head without snout. Soft dorsal very high, the longest rays as long as snout and half eye. Anal much lower than dorsal, longest rays about equal to postorbital part of head. Pectorals about as long as snout, ventrals as long as head without snout, their last ray attached by membrane to the ventral plates. Caudal truncate. Colour in life bright red, in spirits light reddish. Outer border of dorsal dark. Anal brown with an interrupted white longitudinal median band. Outer border of pectorals and of caudal dusky. Length 200 mm.

Habitat: Celebes (Gorontalo); Arafura Sea, 304 m! — Philippines.

4. **Peristedion** Lacepède

(Lacepède, Hist. Nat. Poissons III, 1802, p. 368)

Peristethus Kaup, Proc. Zool. Soc. 1859, p. 103.
Nemaperistedion Fowler, Proc. U. S. Nat. Mus. 85, 1938, p. 126.

Head, body, and tail covered by bony plates and scutes, with exception of chin and breast, which are naked. Preorbitals prolonged into a long flat process, projecting as two horns beyond the snout. No teeth in the jaws. First ventral plate not emarginated anteriorly. Dorsal consisting of a spiny part and a soft part, separated by a deep notch which may separate the fin into two. Pectorals with 2 free rays. Ventrals with a spine and 5 rays.

Distribution: Mediterranian, tropical Atlantic, Indic and western Pacific, eastwards to Hawaii.

Key to the Indo-Australian species of Peristedion

A. A well developed preopercular spine at the end of suborbital ridge.
  a. D. VIII. 16. A. 16—17. Preorbital process not narrower in its basal half than towards its extremity . . . . 1. *P. moluccense* p. 121.
  b. D. VII. 20. A 23. Preorbital process broadest at its base, tapering to its extremity . . . . 2. *P. fowleri* p. 122.
  c. D. VII. 21. A. 20. Preorbital process narrower in its basal half than towards its extremity . . . . 3. *P. murrayi* p. 123.
B. No preopercular spine.
  a. Rostral horns more than twice in the distances of their bases to the eyes . . 4. *P. liorhynchus* p. 124.
  b. Rostral horns as long as the distance of their bases to the eyes . . . . 5. *P. nierstraszi* p. 125.

1. **Peristedion moluccense** Blkr

Peristedion moluccense Bleeker, Nat. Tijdschr. Ned. Indië I, 1850, p. 24.
Peristedion laticeps Schlegel, Bijdr. Dierk. Afl. 5, 1852, p. 43.
Peristedion moluccense Bleeker, Acta Soc. Sci. Indo-Neerl. I, 1856. Beschr. vischsoorten Amboina, p. 30.
Peristethus moluccense Günther, Cat. Brit. Mus. I, 1860, p. 219.
Peristethus laticeps Steindachner, Abh. Senckenb. naturf. Ges. XXV, 1901, p. 424.

D. VIII. 16. A. 16—17. P. 2 + 1.6. 6. or 1. 3. 8. or 1. 9. 3. V. I. 5. Ll. 32—33.

Height (of head) 6—7.2, 6.7—8.4 in length with caudal. Head 2.2—2.4, 2.6—2.7 in length with caudal. Eye 6—6.8, 3.4—4 in snout (with preorbital process) and equal to or nearly so to somewhat concave interorbital space. No teeth in the jaws. Chin with a pair of long branched tentacles, reaching to below eye when laid back. Four small tentacles between them. Rostral process of preorbital twice or thrice (in large specimens) in the distance of its base to the eye. No spines on its base. Suborbital ridge ending in a spine on preopercular edge which is one half of the horizontal diameter of the eye. All head bones granular. A spine above hinderpart of eye, another at the end of the superior postorbital ridge, less distinct in large specimens. A spine, which is not very prominent at the end of the inferior postorbital ridge. Opercle with a strong ridge, ending in a spine. Twenty six dorsal scutes, each with a spine, excepting the last six. Four anterior lateral scutes crowded, all lateral scutes with a spine which is double on those of the caudal peduncle. Lateral line with a bent down; nowhere pores are visible. Twenty two or twenty three sublateral spined scutes. Ventral plastron consisting of three median bony plates, the anterior one longer than broad, the others broader than long. The anus is situated in the middle of the border between the second and third plates. Origin of dorsal above end of opercle. Dorsal spines flexible and hardly different from the rays, longest longer than horizontal diameter of eye. Anal slightly less deep than dorsal. Pectorals longer than head without snout. Ventrals not or scarcely reaching anus. Caudal emarginate. Colour uniform brown, red in life. Length 436 mm. (Types of *P. moluccense* and *P. laticeps* in the Leiden Museum examined).

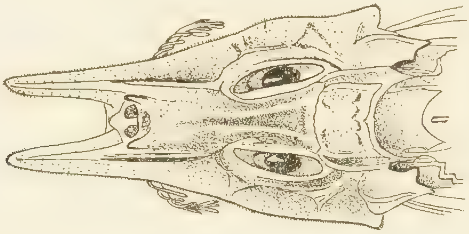

Fig. 35. *Peristedion nierstraszi* M. Weber. Nat. size.

Habitat: Sangir Islands; Ternate; Ambon!; Banda!; Ki Islands.

2. **Peristedion fowleri** nom. nov.

Nemaperistedion orientale Fowler, Proc. U. S. Nat. Mus. 85, 1938, p. 127.

D. VII. 20. A. 23. P. 2. 12.1 + 2. V. I. 5. Ll. 35.

Height $4^1/_3$ in length measured from snout tip inside rostral extensions. Head $2^3/_5$, width $1^1/_6$. Snout $1^7/_8$ in head. Eye $4^3/_5$, $2^1/_5$ in snout, little greater than deeply concave interorbital space.

Maxillary extends $^5/_6$ to eye. Barble as long as head, reaches front of anal, with 10 pairs of filaments; 2 pairs anteriorly each side of lower mental filaments and 2 filaments on the inner edge of each mandibular ramus or chin, with posterior bifid. Mouth edentulous. Rostral extensions $1^1/_6$ in eye, about 2.6 in the distance of their base to the eye. Very small, short, median rostral spine at last fourth of snout. Small antero-supraorbital spine each side, and pair of postero-supraorbital spines, posteriorly greatly larger and erect. Pair of large erect diverging occipital spines, postocular keel ends in short, small obtuse suprascapular spine. Small, slender opercular spine with distinct keel, its length $1^2/_3$ in eye. Edge of keel of suborbital stay unevenly and slightly undulated, ends behind in long slender preopercular spine, reaching $^1/_3$ of pectoral, or its length subequal with eye. From above gill opening 34 + 1 bony lateral plates; 4 rows of diminishing spiniferous plates on trunk and tail; spines all large, strong, erect, and surfaces of plates rough rugose; hind pair of plates on belly before vent $1^3/_4$ in length of front pair; row of 3 small plates, each bearing horizontal keel ending in short spine, above gill opening and 3 similar subvertical or inclined plates behind gill opening. Second dorsal spine $4^1/_4$ in head, fifth ray $4^1/_{10}$. Fourth anal ray $5^2/_5$. Pectorals $2^1/_8$ in head, ventrals $2^1/_4$. Caudal little concave behind, truncate as expanded. Light brown, paler to whitish below. Variable, scattered small brown spots on head and body above. Greater upper anterior portion of spinous part of dorsal blackish. Upper submarginal part of soft dorsal anteriorly with narrow blackish brown streak. Pectorals slightly brownish submarginally. Fins otherwise all pale or whitish. Length 179 mm. (After Fowler, not seen by me).

Habitat: Borneo, Sibuko Bay, 558 m; between Halmahera and Makian Island, 490 m; between Halmahera and Kayoa Island, 414—477 m. — China Sea, vicinity of Formosa, 414 m, Philippines, 251—360 m.

Note. As the genus *Nemaperistedion* differs in no important points from *Peristedion*, the unusual length of the mental barbels being of no generic value, I place Fowler's species in lastnamed genus, but as the name *orientale* is preoccupied by *P. orientale* Schl., I had to give it a new name.

3. **Peristedion murrayi** (Gthr)

Peristethus murrayi Günther, Zool. Challenger Exp. VI, 1880, p. 52.

D. VII. 21. A. 20. P. 2 + 2. 10. 3. V. I. 5. Ll. 30.

Greatest height through eye, 5.3, 5.9 in length with caudal. Head 2.2, 2.5 in length with caudal. Eye 5.6, 3.7 in snout (with preorbital rostral horn), and equal to concave interorbital space. No teeth in jaws. Chin with a pair of long, branched tentacles, reaching almost end of head when laid back. About 8 small tentacles, some of them bifid, between them. Rostral process of preorbitals narrower in its basal half than towards its extremity, twice in the distance of its base to the eye. Snout and forehead without spines. A small spine above posterior margin of the orbits, and one on each side of the occiput, at the end of the upper postorbital ridge. Suborbital ridge prominent, trenchant, the edge minutely denticulated, terminating in a slender preopercular spine nearly as long as the eye. Opercle with two divergent ridges, not ending in pronounced spines. Thirty one dorsal scutes, each with a spine, except the last two. Anterior lateral scutes crowded, all 34 lateral scutes with a spine. No bifid spines on caudal peduncle. Lateral line with a bent down, nowhere pores are visible. Twenty six sublateral scutes, beginning between the 7th and 8th lateral scutes; each with a simple spine. Ventral plastron consisting of two pairs of coalesced plates before anus, each with ridges radiating from its centre, and a network of smaller bony ridges. Twenty six ventral plates; in the first the anus is situated, the origin of the anal on the second plate. Origin of dorsal above end of opercle. Dorsal spines flexible and hardly different from rays. Anal slightly less deep than dorsal, pectorals longer than head without snout. Ventrals about as long as snout without rostrum. Caudal emarginate. Dorsal with a blackish margin. Length 190 mm (Type of the species in the British Museum examined).

Habitat: Banda Sea, 360 m!

4. **Peristedion liorhynchus** (Gthr)

Peristethus liorhynchus Günther, Proc. Zool. Soc. London 1871, p. 663.

D. VIII. 21. A. 21. P. 2 + 2. 7. 2. V. I. 5.

Greatest height through eyes, 7.1, 8 in length with caudal. Head 2.8, 3.2 in length with caudal. Eye 5, 3.1 in snout and equal to concave interorbital space. No teeth in the jaws. Two fleshy tentacles, at some distance from symphysis of lower jaw, reaching to below frontborder of eye when laid back, beset with numerous small, simple tentacles. A series of tentacles along lower jaw between them. Rostral horns of preorbitals more than twice in the distance of their bases to the eyes. No spines on their bases. Suborbital ridge not ending in a spine at edge of preopercle. Preorbitals granulated, without spines. Supraorbital ridge granulated, a spine above hinderpart of eye, followed by 2 spines on superior postorbital ridge. The inferior postorbital ridge is also a continuation of the supraorbital ridge; it is much granulated and hence spines are indistinct, its edge is scalloped. Opercle with a granular ridge, ending in a spine. Thirty dorsal scutes, each with a spine, but the spines diminishing in size posteriorly, those on caudal peduncle almost obsolete. The right and left dorsal scutes before origin of dorsal fused into one. Thirty five lateral scutes, each with a spine and the anterior ones with a pore of the lateral line at the base of the spine; from the 24th scute to caudal each spine of the scutes is double. The anterior lateral scutes are small and crowded, the row of spines and pores forming a sharp bent downwards. Twenty eight sublateral scutes, the first below the 8th lateral scute. The plastron is formed by two pairs of scutes, the anterior pair deeper than long, the posterior one longer than deep. Twenty six ventral scutes, the anus is situated in the first one, the origin of the anal between the second and the third ones, the last one at base of caudal. Origin of dorsal above end of opercular spine. First and second dorsal spines of equal length and half as long as snout (with rostral horn). The fifth dorsal spine about as long as postorbital part of head, the 8th much shorter and also much shorter than the first dorsal ray, the fin being deeply notched. The median dorsal rays somewhat more than horizontal diameter of eye. Anal scarcely less deep than soft dorsal. Free pectoral rays surpassing anus. Ventrals reaching to anus. Caudal emarginate. Dorsal with a black margin, pectorals with a broad, dark, subterminal band. Length 225 mm. (Description made after the type, examined by me in the British Museum).

Habitat: Celebes (Menado!). — Admirality Islands.

5. **Peristedion nierstraszi** M. Weber (Fig. 35, p. 122)

Peristedion Nierstraszi Max Weber, Siboga Exp. Fische, 1913, p. 514.
Peristedion nierstraszi Herre, Notes Fish. Zool. Mus. Stanford Univ. 1934, p. 68.

D. VIII. 1. 21. A. 22. P. 2 + 2. 7. 2 or 2. 8. 2 or 3. 7. 2. V. I. 5. Ll. 37.

Greatest height through eyes, 7.2—7.3, 7.9—8 in length with caudal. Head 2.5—2.6, 2.7—2.8 in length with caudal. Eye 5.5—6.4, 3.8—4.1 in snout and about equal to concave interorbital space. No teeth in the jaws. Along lower jaw a series of tentacles in groups of three, four, or more, which are connected at their base. Two fleshy tentacles, at some distance from symphysis of lower jaw, reaching to below frontborder of eye when laid back, beset with numerous small, simple tentacles. Rostral horns of preorbital as long as the distance of their bases to the eye. No spines on their bases. Suborbital ridge not ending in a spine at edge of preopercle. Preorbitals granulated, but without spines. Supraorbital ridge granulated, with a spine above hinderpart of eye, followed on superior postorbital ridge by 3 spines, the median of which is very small. The inferior postorbital ridge is also a continuation of the supraorbital ridge; it is granular and spiny along its scalloped edge. Opercle with a granular ridge, ending in a spine. 32—33 dorsal scutes, each with a spine, but the spines diminishing in size posteriorly, those on caudal peduncle almost obsolete. The left and right first dorsal scutes fused into one before origin of dorsal. 35 lateral scutes, each with a spine and a pore of the lateral line at their base; from the 23rd to caudal there is a second smaller spine in front of the other on each scute, these two spines connected by a ridge. The five anterior lateral scutes are small and crowded, the row of spines and pores forming a sharp bent downwards. The following scutes much deeper than long. Sublateral scutes beginning below fifth lateral scute, 22—24 in number, each with a spine. A large ventral scute, apparently formed by coalescent paired scutes which have a median longitudinal ridge, forming two parallel ridges, continued into the spined ridges of the scutes bordering the anal fin; the two anterior ones of this series of 26 scutes between anus and origin of anal, the last ones on caudal peduncle. The spines of these scutes obsolete posteriorly. Origin of dorsal above opercular spine. First dorsal spine not much shorter than second; second to fourth spines subequal, scarcely as long as postorbital part of head, last spine much shorter, the fin deeply notched. Soft dorsal rays lower than spines, longest about equal to horizontal diameter of eye. Anal slightly less deep than soft dorsal. Free pectoral rays surpassing anus. Pectorals equal to head without snout. Ventrals somewhat shorter, reaching to anus. Caudal emarginate. Colour of preserved specimens very light pinkish. Dorsal with a dark brown margin, pectorals with one or two dark brown cross bands. Length 160 mm.

Habitat: Flores Sea, 521—538 m! — Philippines.

Note. This species is near *P. rivers-andersoni* Alcock from off Colombo, Ceylon, but differs by the absence of spines at the base of the rostral process and by a greater number of spines in the dorsal fin. J. L. B. Smith (Trans. Royal Soc. S. Africa XXII, Part IV, 1934, p. 331) says that there is "a small but distinct spine on the dorsal surface of the base of each rostral process" in one of the typical specimens of *nierstraszi* he examined, but I am unable to find them in the three specimens which formed the base of Weber's description. *P. nierstraszi* is also very near *P. liorhynchus,* differing in the longer rostral forks.

6. Family PLATYCEPHALIDAE

Elongate. Head depressed. Head, body, and tail covered by ctenoid scales on the back and by cycloid scales on the lower side. Two pairs of nostrils. Head with spiny bony ridges. Villiform teeth in jaws and on vomer and palatines. Two dorsals, the first with VI—IX spines, the second with 11—15 rays and longer than the first one. Anal long, with 11—14 rays. Ventrals with a spine and 5 rays. Gill membranes free from isthmus. Vertebrae 27. Ribs attached to sessile epipleurals.

Key to the Indo-Australian genera of Platycephalidae

a. Seven to nine dorsal spines. Caudal truncate or rounded . . . . 1. *Platycephalus* p. 127.
b. Six dorsal spines. Caudal forked, the upper lobe the longer and often filamentous . . . . . . 2. *Elates* p. 164.

1. **Platycephalus** Bloch

(Bloch, Ausländ. Fische IX, 1795, p. 96)

Thysanophrys Ogilby, Proc. Linn. Soc. New S. Wales XXIII, 1898, p. 40.
Insidiator Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII, 1900, p. 368.
Grammoplites Fowler, Journ. Acad. Nat. Sci. Philadelphia, 1904, p. 550.
Rogadius Jordan & Richardson, Proc. U. S. Nat. Mus. XXXIII, 1908, p. 630.
Inegocia Jordan & Thompson, ibid. XLVI, 1913, p. 70.
Onigocia Jordan & Thompson, l.c.
Suggrundus Whitley, Mem. Queensl. Mus. X, Part I, 1930, p. 26.
Sorsogona Herre, Notes Fishes Zool. Mus. Stanford Univ. 1934, p. 67.
Coccius Fowler, Hongkong Naturalist VI, Suppl. 1938, p. 37.
Cymbacephalus Fowler, Proc. U. S. Nat. Mus. 85, 1938, p. 90.
Cocella Whitley, Austr. Zoologist 1940, p. 243.

Head and body much depressed, caudal peduncle more or less compressed. Body and tail covered by rather small or very small ctenoid scales above, cycloid scales on flat underside. Mouth horizontal, wide, the lower jaw more or less projecting. Villiform teeth in bands in the jaws, those near symphysis of upper jaw often enlarged, caninoid and directed backwards. Teeth on vomer in a single transverse or in two patches. Palatines with generally narrow and elongate bands of teeth. Tongue spatulate, smooth. Head with the usual bony ridges, generally provided with spines or serrations. One, two or three spines on posterior end of preopercle. Opercle generally with two spines. The first dorsal fin consisting of VII—IX spines, the first spine small, somewhat remote and connected by a low membrane to the second. Second dorsal fin consisting of 11—15 rays which are forked, excepting the first. Anal with 11—14 rays, all simple or all forked, excepting the first. Origin of anal about below origin of second dorsal. Pectorals with a broad base, the upper and lower rays simple, the median rays forked. Ventrals with a spine and five rays, the fifth ray simple. Caudal truncate or slightly rounded. Gill opening wide; gill membranes free from each other and from isthmus.

Distribution. Bottom fishes from coastal and deep water, with many species in the Indic and West Pacific.

Note. The genus *Platycephalus* has been divided in a number of genera by recent authors but the general habitus of all species is so alike, that I prefer to keep them in one genus. In the key the name of most of these genera have been inserted.

Key to the Indo-Australian species of Platycephalus

I. Teeth on vomer in one transverse patch. Interorbital space not concave (*Platycephalus* s. str.) . . . . 1. *P. indicus* p. 131.

II. Teeth on vomer in two separate patches.

A. A deep pit immediately behind eye. Tentacles on eye and a cutaneous flap on subopercular edge (*Cymbacephalus*).

a. Eye 2.8—3.3 in snout, the length of which greatly exceeds the distance between the outer borders of the eyes. Maxillary ending before eye . . . . 2. *P. longiceps* p. 134.

b. Eye 1.5—1.9 in snout, the length of which is less than, or equal to the distance between the outer borders of the eyes. Maxillary reaching to below anterior half of eye . . . . 3. *P. nematophthalmus* p. 136.

B. No deep pit behind eye.

a. A strong antrorse spine on the

lower face of the preopercle. Supra- and infra orbital ridges finely serrated (*Rogadius*).

a¹. Sq. l. 70—80. Ltr. $\begin{array}{c}6\text{—}7\\ \hline 1\\ \hline 15\text{—}16\end{array}$ . . . 4. *P. polyodon* p. 138.

b¹. Sq. l. about 55. Ltr. $\begin{array}{c}4\text{—}5\\ \hline 1\\ \hline 11\text{—}12\end{array}$ 5. *P. pristiger* p. 139.

b. No antrorse preopercular spine.

a¹. All scales of lateral line with a strong spine (*Grammoplites*) 6. *P. scaber* p. 140.

b¹. Anterior half or third of scales of lateral line provided with spines. Ridge which ends in inferior opercular spine more or less spiny. Preopercular spine long, reaching on base of pectoral (*Repotrudis*).

a². Two to five spines on anterior orbital rim. Opercular ridge finely serrated. Supraorbital, postorbital, and suborbital ridges serrated . . 7. *P. tuberculatus* p. 142.

b². One spine on anterior orbital rim. A few spines only on operculer ridge. Supraorbital, postorbital, and suborbital ridges with a moderate number of spines 8. *P. rodericensis* p. 144.

c¹. Lateral line smooth or with a few of the anterior scales spiny.

a². Supraorbital ridge spiny in its entire length.

a³. Sq. l. 29—34. Ltr. $\begin{array}{c}2\\ \hline 1.\\ \hline 6\end{array}$ 2—4 spines on anterior orbital rim . . . . . 9. *P. oligolepis* p. 146.

b³. Sq. l. 50. Ltr. $\begin{array}{c}2\\ \hline 1\\ \hline 11\end{array}$. One spine on anterior orbital rim. A minute tentacle on eye . . . . 10. *P. horai* p. 147.

c³. Sq. l. 70. Ltr. $\begin{array}{c}5\\ \hline 1\\ \hline 13\end{array}$. One spine in front of eye. Supraorbital ridge with 5—6 spines . . . . . . 11. *P. sculptus* p. 148.

d³. Sq. l. about 68. Ltr. $\begin{array}{c}5\\\hline 1\\\hline 16\end{array}$. One spine in front of eye. Supraorbital ridge finely serrated . . . . 12. *P. cantori* p. 149.

b². Only posterior part of supraorbital ridge serrated.

a³. Sq. l. 33—63. A few anterior scales of lateral line spiny.

a⁴. Sq. l. 33—35. Ltr. $\begin{array}{c}2\frac{1}{2}\\\hline 1\\\hline 8-10\end{array}$. A. 11. A well developed tentacle on eye. Suborbital ridge serrated in its posterior half. D¹. VIII 13. *P. macrocephalus* p. 151.

b⁴. Sq. l. 57—63. Ltr. $\begin{array}{c}4-6\\\hline 1\\\hline 16-20\end{array}$. A. 12 (13). No tentacle on eye. A rounded flap on interopercle. Suborbital ridge with a few distances spines. D¹. IX. . . . . . . 14. *P. malayanus* p. 152.

c⁴. Sq. l. 55—63. Ltr. $\begin{array}{c}7-8\\\hline 1\\\hline 13-14\end{array}$. A. 12. No tentacle on eye. A well developed interopercular flap. Suborbital ridge with 3 spines. D¹. IX . . 15. *P. isacanthus* p. 154.

d⁴. Sq. l. about 54. Ltr. $\begin{array}{c}3\\\hline 1\\\hline 9-11\end{array}$. A. 13—14. No tentacle on eye. No interopercular flap. Suborbital ridge serrated posteriorly. A patch of spines immediately behind eye, between superior and inferior postorbital ridges. D^1. VIII. . 16. *P. celebicus* p. 155.

b³. Sq. l. 75—108. Suborbital ridge with a few distant spines.

a⁴. Anterior scales of Ll. keeled, but not spiny. Eye with a minute tentacle. Sq. l. 82—95, Ltr. $\begin{array}{c}5\text{—}6\\\hline 1\\\hline 15\end{array}$ . . . . 17. *P. carbunculus* p. 156.

b⁴. Ll. unarmed. Eye without tentacle. A tentacle-like interopercular flap. Sq. l. 75—80. Ltr. $\begin{array}{c}6\\\hline 1\\\hline 12\end{array}$ . . 18. *P. bataviensis* p. 158.

c⁴. 4—5 anterior scales of Ll. spiny. Eye without tentacle. A feebly developed rounded interopercular flap. Sq. l. 90—108. Ltr. $\begin{array}{c}8\text{—}9\\\hline 1\\\hline 11\text{—}18\end{array}$ 19. *P. crocodilus* p. 159.

d⁴. 3 anterior scales of Ll. spiny. Eye without tentacle. No interopercular flap. Sq. l. about 95. Ltr. $\begin{array}{c}6\text{—}7.\\\hline 1\\\hline 15\end{array}$. 20. *P. sundaicus* p. 162.

c². Supraorbital ridge and all other ridges on head without serrations, only ending in spines. Preopercular spine small and blunt. . . . . 21. *P. bosschei* p. 163.

1 **Platycephalus indicus** (L.)

Callionymus indicus Linné, Syst. Nat. Ed. 10. 1758, p. 250.
Cottus insidiator Forskål, Descr. Animal, 1775, Pisces, p. 25.
Platycephalus Spathula Bloch, Ausländ, Fische IX, 1795, p. 97.
Platycephalus spatula Bloch Schneider, Syst. Ichth. 1801, p. 59.
Platycephalus insidiator Bloch Schneider, l.c.

Platycephalus endrachtensis Quoy & Gaimard, Voy. Uranie et Physicienne, Zool. 1824, p. 353.

Platycephalus insidiator Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 227.

Platycephalus endrachtensis Cuvier & Valenciennes, ibid. p. 240.

Platycephalus insidiator Bleeker, Verh. Bat. Gen. XXII, 1849. Bijdr. kennis Scleroparei, p. 6.

Platycephalus insidiator Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850, p. 1019.

Platycephalus insidiator Günther, Cat. Brit. Mus. II, 1860, p. 177.

Platycephalus insidiator Kner, Novara Exp. Zool. Theil I, Fische, 1865—1867, p. 121.

Platycephalus insidiator Klunzinger, Verh. zool. bot. Ges. Wien XX, 1870, p. 815.

Platycephalus insidiator Day, Fishes of India, Part II, 1876, p. 276.

Platycephalus indicus Bleeker, Arch. Neerl. Sci. Nat. XIII, 1878, p. 49. — Verh. Akad. Amsterdam XIX, 1879, Révision Platycephalus p. 8. — Atl. Ichth. IX, 1879, Tab. 418, fig. 3.

Platycephalus insidiator Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 216.

Platycephalus insidiator Klunzinger, Fische des rothen Meeres I, 1884, p. 126.

Platycephalus insidiator Sauvage, Poissons de Madagascar, 1891, p. 304.

Platycephalus indicus Steindachner, Ann. Hofmuseum Wien XI, 1896, p. 206.

Platycephalus insidiator Evermann & Seale, Proc. U. S. Nat. Mus. XXXI, 1906, p. 510.

Platycephalus insidiator Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 38. — Proc. Davenport Acad. Sci. X, 1910, p. 15.

Platycephalus indicus Jordan & Richardson, Proc. U. S. Nat. Mus. XXXIII, 1908, p. 641.

Platycephalus insidiator Gilchrist & Thompson, Ann. S. Afric. Mus. VI, Part 2, 1908, p. 194.

Platycephalus indicus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 932.

Platycephalus indicus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 300.

Platycephalus indicus Wu, Contr. Biol. Lab. Sci. Soc. China VII. Zool. Ser. 1931, p. 32.

Platycephalus indicus J. L. B. Smith, Rec. Alban. Mus. IV, 1935, p. 228.

Platycephalus indicus Herre, Rec. Indian Mus. XLI, 1939, p. 340.

Platycephalus indicus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950, p. 378.

Thysanophrys indicus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 253.

D^1. VIII. D^2. 12—13. A. 13. P. 2. 13. 4 or 2. 11. 5 or 1. 13. 4. V. I. 5. Ll. 118—134. Ltr. $\begin{array}{c}10\text{-}11\\\hline 1\\\hline 18\text{-}20\end{array}$.

Much compressed. Height 11.3—12.6, 12.9—14.7 in length with caudal. Greatest breadth at origin of pectorals, 4.4—4.8 in length without caudal. Head 3—3.3, 3.5—3.8 in length with caudal. Eye 6.2—8.9, 1.9—2.6 in snout. Interorbital space scarcely concave, less than eye in young, much more than eye in large specimens. Anterior and posterior nostrils both with a low rim. Mouth large, lower jaw projecting. Maxillary reaching to below middle of eye. A broad band of villiform teeth in the upper jaw, some of the inner teeth near symphysis caninoid. In the lower jaw a row of rather large crowded teeth and several rows of smaller teeth at their outer side, more numerous near symphysis. Vomer with a single transverse curved band of small teeth; caninoid ones at the inner side of its extremities. A single row of large caninoid teeth on palatines. Tongue smooth. Preorbital with two indistinct blunt spines. Supraorbital ridges very low and almost smooth, converging from eye backwards, more so in large specimens, where the eyes are farther apart; they end posteriorly in a number of radiating, fanlike low ridges, which again are continued as a single pair of superior postorbital ridges, provided with a small spine, directed backwards. Inferior postorbital ridge with similar very low spines. Suborbital ridge smooth, ending in an upturned, strong, but short preopercular spine; a second, longer spine below it. One flat opercular spine. A smooth suprascapular ridge ends pointed posteriorly. Head above covered with small ctenoid scales, 14—20 rows of scales between occiput and origin of dorsal. First dorsal spine minute, separate, not attached to second spine by membrane Third dorsal spine longest, about equal to eye and snout, the lower jaw included. Last dorsal spine minute. Second dorsal separated from first dorsal by 4—6 scales. First ray of second dorsal longest, shorter than third dorsal spine, simple or indistinctly forked, following rays forked. Origin of anal below that of second dorsal, all of its rays forked, about of same depth as second dorsal. Pectorals with a number of the median rays forked, the fin rounded, about as long as eye and snout, the lower jaw included. Ventrals far apart, their origin between that of

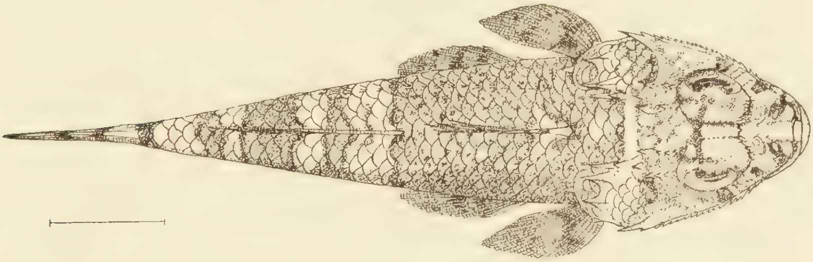

Fig. 36. *Platycephalus oligolepis* Regan. After Weber.

pectorals and of dorsal, the inner rays longest and equal to postorbital part of head. Caudal truncate. Scales of upper parts ctenoid, of lower parts cycloid. Colour of preserved specimens brownish above, white below. The upper side is more or less speckled with whitish and in young specimens often a white blotch below origin of second dorsal and another below posterior part of that fin. Fins light, more or less narrowly banded with dark, the caudal with characteristic longitudinal or obliquely longitudinal black stripes. Length up to 670 mm.

Habitat: Singapore; Sumatra (Telokbetong, Tandjong, Benkulen, Padang, Palembang, Bagan Si Api Api); Bintang; Biliton; Java (Jakarta, Surabaya, Prigi); Madura; Borneo (Banjermassin, Pontianak, Sarawak, Sandakan); Celebes (Makassar !, Bulukomba, Badjoa); Saleyer !; Sula Islands !; Batjan; Ambon !; Goram; Aru Islands !; New Guinea (Utanata). — East coast of South Africa, Natal !, Mosambique, Zanzibar, Madagascar, Red Sea, Aden, Arabean Sea, coasts of Balutchistan and India, Ceylon, Burma, Andamans, coasts of Siam, Malay Peninsula, China, Korea, Japan, Port Arthur, Riu Kiu Islands, Formosa, Philippines, West Australia and Queensland. In sea and brackish water.

Note. Sauvage, l.c., doubts if *P. endrachtensis* belongs to this species, but it is not clear from what he says if he has reexamined the type in the Paris Museum.

2. **Platycephalus longiceps** C. V.

Platycephalus longiceps Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 255.

Platycephalus tentaculatus Rüppell, Neue Wirbelthiere. Fische des rothen Meeres, 1835, p. 104.

Platycephalus punctatus Peters, Monatsber. Akad. Berlin, 1855, p. 433 (nec C. V.).

Platycephalus tentaculatus Günther, Cat. Brit. Mus. II, 1860, p. 184.

?*Platycephalus tentaculatus* Kner, Novara Exp. Fische, 1865—1867, p. 122.

Platycephalus longiceps Peters, Monatsber. Akad. Berlin, 1868, p. 258.

Platycephalus longiceps Klunzinger, Verh. zool. bot. Ges. Wien. XX, 1870, p. 813.

Platycephalus tentaculatus Günther, Fische der Südsee II, 1876, p. 166.

Platycephalus longiceps Sauvage, Nouv. Arch. Mus. Hist. Nat. (2) I, 1878, p. 151.

Platycephalus longiceps Klunzinger, Fische des rothen Meeres I, 1884, p. 127.

Thysanophrys tentaculatus Seale, Philipp. Journ. Sci. V, No 4, 1910, p. 286.

Platycephalus tentaculatus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 932.

Platycephalus tentaculatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd ed. 1950, p. 378.

D^1. IX. D^2. 11 (12): A. 11. P. 2. 7. 8 or 2. 9. 8 or 2. 11. 7. V. I. 5. Sq. l. 95—105. Ltr. $\begin{array}{c}8\\ \hline 1\\ \hline 18\text{-}20\end{array}$.

Height 8.7—8.8, 10.1—10.4 in length with caudal. Greatest breadth at origin of pectorals 4.7—5.8 in length with caudal. Head 2.6, 3—3.2 in length with caudal. Eye 6.7—7.7, 2.8—3.3 in snout which greatly exceeds distance between outer borders of eye. Interorbital space concave, somewhat more than half diameter of eye. Maxillary not reaching as far as below anterior border of eye. Bands of small pointed teeth in the jaws, and on vomer and palatines, those on vomer in two separate oval patches. Anterior nostril with a small tentacle, the posterior one with a short tube. No preorbital spines. Supraorbital ridge with a spine above frontborder of eye, and several crowded spines above and behind hinderborder of eye, ending in a somewhat isolated spine which is the base of fan like radiating low ridges. Superior postorbital ridge with a single spine. Inferior postorbital ridge beginning behind a rather deep pit which is situated immediately behind eye; the ridge consists of 4 more or less unconnected spines. Suborbital ridge with two spines, one below frontborder and the other below hindborder of eye, ending in a pointed spine at preopercular edge which has a second, shorter, and blunter spine below it. An arborescent tentacle on upper border of eye, a small tentacle in front of it and sometimes one or two similar ones behind it. A broad based,, leaf like tentacle, more or less festooned along its free border, on subopercular edge below preopercular spines. Two opercular spines. Preopercle and opercle covered with ctenoid scales, head otherwise naked. About 11—13 rows of scales before dorsal. Origin of dorsal slightly behind posterior border of opercular flap, the first spine minute, connected by a low membrane to second spine which is subequal to third and fourth spines and as long as snout. Following spines decreasing in length, the ninth minute. All rays of second dorsal branched, the fin not or scarcely lower than the first dorsal, the membranes between the rays incised. One or two scales between the two dorsals. Anal similar to second dorsal, but slightly lower. Pectorals rounded, as long as snout, a various number of the median rays forked, the rest simple. Inner ray of ventrals longest, equal to postorbital part of head. Caudal slightly rounded. Scales of upper side ctenoid, of lower side cycloid. Colour of preserved specimens brown above, white below, with more or less distinct darker blotches or indistinct cross bars. Fins white with brown spots which are crowded, forming more or less distinct large blotches or bands on all the fins, besides forming wavy lines or marmorations in the interspaces between the blotches, excepting anal and base of first dorsal. Length 540 mm.

Habitat: Singapore; Java?; Borneo (Sandakan); Kei Islands! — Kori Bay and Delagoa Bay, Mossambique, Zanzibar, Red Sea, Pelew Islands.

Note. It is not certain that *P. longiceps* which is based on a drawing, is the same as *P. tentaculatus*. It is also uncertain if the specimens described above, which were collected by the Siboga Expedition and wrongly identified as *P. nematophthalmus,* belong to the species from the Red Sea. They entirely agree with *tentaculatus* as described and figured by Günther (1876, l.c.). Klunzinger, however, describes *tentaculatus* from the Red Sea as wanting a postorbital groove or pit, and also Rüppell's figure does not show this feature. It is close to *nematophthalmus,* which has a more eastern distribution, although the two areas overlap. Besides the differences between the two species mentioned in the key, I can add that the snout is somewhat spatulate in *longiceps,* its sides being slightly concave, whereas the sides of the snout are straight in *nematophthalmus.*

3. **Platycephalus nematophthalmus** Gthr.

Platycephalus isacanthus ?, Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 481 (nec. C. V.).

Platycephalus nematophthalmus Günther, Cat. Brit. Mus. II, 1860, p. 184. — Fische der Südsee II, 1876, p. 166. Tab. 107. Fig. B.

Platycephalus nematophthalmus Steindachner, Sitz. Ber. Akad. Wien LX, 1869, p. 561.

Platycephalus nematophthalmus Bleeker, Verh. Akad. Amsterdam XIX, Révision Platycephalus, 1879, p. 10. — Atl. Ichth. IX. Tab. 420, Fig. 3.

Platycephalus nematophthalmus Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 221.

Platycephalus nematophthalmus Steindachner, Ann. Hofmuseum Wien XI, 1896, p. 226.

Insidiator nematophthalmus McCulloch, Endeavour Sci. Res. II, Part 3, 1914, p. 149. — Austr. Zoologist II, Part III, 1922, p. 121.

Thysanophrys nematophthalmus Fowler & Bean, Proc. U. S. Nat. Mus. LXII, Art. 2, 1922, p. 64.

Suggrundus nematophthalmus Whitley, Rec. South Austr. Mus. V, No. 3, 1935, p. 355.

Cymbacephalus nematophthalmus Whitley, Austr. Zoologist X, Part 1, 1941, p. 44 — W. Austr. Fish. Bull. No. 2, 1948, p. 30.

D^1. VIII—IX. D^2. 11—12. A. 11 (12). P. 2. 8. 9 or 1. 9. 9 or 2. 10. 7 or 2. 10. 8 or 2. 9. 9. V. I. 5. Sq. l. 70—100. Ltr. $\frac{8}{\frac{1}{20\text{-}24}}$.

Height 8.4—8.7, 10.3—10.5 in length with caudal. Greatest breadth at origin of pectorals 5.4—5.5 in length without caudal. Head 2.7—2.8, 3.2—3.4 in length with caudal. Eye 4.6—5.5, 1.5—1.9 in snout which is less than or equal to distance between outer border of eyes. Interorbital space concave, a little more or less than half diameter of eye. Maxillary reaching to below anterior half of eye. Bands of small pointed teeth in the jaws, vomer and palatines, those of vomer in two separate oval patches, pointed behind; the inner row of teeth in the lower jaw slightly enlarged. Anterior nostril with a small tentacle, the posterior one with a short tube. Preorbital without spine. Supraorbital ridge with a spine above frontborder of eye and 4 or 5 crowded spines above hinder border of eye. A number of low ridges radiates fan like from its posterior end, followed by the short superior postorbital ridge which has two low spines. Inferior postorbital ridge beginning behind a deep pit which is situated immediately behind the eye: it consists of two parts, the first with one, the second with about 3 spines. Suborbital ridge with a spine below posterior border of eye, here deflected somewhat downwards and ending in a short blunt spine on preopercular edge. A second similar spine below it. Two tentacles on eye, the anterior one small and simple, the posterior one longer and arborescent. Subopercle with a leaf like tentacle, more or less denticulated along its free border, situated below the preopecular spines. Two opercular spines. Preopercle and opercle covered with ctenoid scales, head otherwise naked. About 12—15 rows of scales before dorsal. Origin of dorsal slightly behind posterior border of opercular flap, the first spine minute, connected by a low membrane to the second which is as long as the third and about equal to snout and half eye. Following spines decreasing in length, the ninth minute, and sometimes hidden between the scales. All rays of second dorsal branched, the fin slightly lower than the first dorsal, the membranes between the rays incised. Two or three scales between the two dorsals. Anal similar to second dorsal, but less deep. Pectorals rounded, slightly less than snout and eye. A variable number of the median rays forked, the others simple. Inner ray of ventrals longest, about equal to postorbital part of head. Caudal slightly rounded. Scales of upper part ctenoid, of lower side cycloid, those on lower side of tail sometimes more or less ctenoid. Colour of preserved specimens brown above, with more or less regular and sometimes indistinct lighter cross bands, narrower than interspaces. First dorsal white at base and along upper border, brown with more or less narrow white marmorations on rest of fin. Second dorsal as first dorsal, but without terminal white band and the brown colour more faded. Peculiar short, dark brown, narrow, vertical stripes irregularly spread here and there on the fin. Anal white, brown along its lower border, sometimes with white marmorations as the dorsal, sometimes the brown colour is reduced to spots behind each ray. Caudal light brown with narrow white marmorations and with the same peculiar dark vertical stripes as the dorsal. Pectorals and ventrals as the caudal, but the dark stripes reduced to points on the pectorals. Length 580 mm.

Habitat. Singapore; Bintang; Borneo (Sandakan); Celebes (Makassar!, Bulucomba, Badjoa); Saleyer!; Morotai; Ternate; Buru; Waigeu; Aru Islands!; New Guinea (Port Moresby) — Siam, Malay Peninsula, Philippines, Queensland, New South Wales, W. Australia.

4. **Platycephalus polyodon** Blkr

Platycephalus polyodon Bleeker, Nat. Tijdschr. Ned. Indië IV, 1853, p. 462.
Platycephalus polyodon Günther, Cat. Brit. Mus. II, 1860, p. 183.
Platycephalus polyodon Bleeker, Verh. Akad. Amsterdam XIX. Révision Platycephalus, 1879, p. 25. — Atl. Ichth. IX, Tab. 420, Fig. 2.
Rogadius polyodon Herre, Philipp. Journ. Sci. 59, 1936, p. 367.

D^1. IX. D^2. 12. A 11 (12). P. 2. 10. 9. V. I. 5. Sq. l. about 70—80. L.tr. $\begin{array}{c}6\text{-}7\\ \hline 1\\ 15\text{-}16\end{array}$.

Height 7.8, 9.4 in length with caudal. Head 2.68, 3.2 in length with caudal. Eye 3.57, 1.2 in snout. Interorbital space 7 in eye. Maxillary reaching a little beyond front border of eye. Villiform teeth in the jaws, in two patches on vomer and in elongate patches on palatines. Anterior and posterior nostrils with a rim, the anterior one with a flap. A strong spine before eye. Supraorbital ridge, superior and inferior postorbital ridges and suborbital ridges finely serrated. Two anterior scales of lateral line scarcely spiny. A strong preopercular spine, a much smaller one below it, followed by a similar spine of the interopercle which has a rather weak antrorse spine anteriorly, 8—10 scales before dorsal. First dorsal spine shorter than longitudinal diameter of eye. Second and third spines subequal, about as long as postorbital part of head, slightly longer than longest dorsal rays. Anal less deep than second dorsal. Pectorals rounded, about equal to postorbital part of head. Ventrals reaching on anal. Caudal rounded. Body and tail with dark blotches or irregular bands. Rays of dorsal and pectorals ringed dark and light.

Length 180 mm. (Specimens of Bleeker's collection in the Leiden Museum examined).

Habitat: Java (Jakarta); Celebes (Menado); Ceram; Ambon. — Philippines.

Note. Karoli (Termeszetrajzi füzetek V, 1882, p. 17) mentions this species from Japan which is most probably erroneous.

5. **Platycephalus pristiger** C. V.

Platycephalus pristiger Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 260.

Platycephalus pristiger Quoy & Gaimard, Voyage Astrolabe, Poissons III, 1834, p. 685,

Platycephalus pristiger Bleeker, Nat. Tijdschr. Ned. Indië XII, 1856, p. 205. — Verh. Akad. Amsterdam XIX. Révision Platycephalus, 1879, p. 29. Atl. Ichth. IX, 1879. Tab. 420. Fig. 1.

Platycephalus asper A. B. Meyer, Anal. Soc. Esp. Hist. Nat. XIV, 1885, p. 21 (nec C. V.).

Platycephalus pristiger Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 301.

Rogadius asper Munro, The marine and fresh water fishes of Ceylon, 1955, p. 251 (nec C. V.).

D^1. I. VIII. D^2. 11. A. 11 (12). P. 2. 11. 8 or 2. 12. 8 or 2. 13. 7. V. I. 5. Sq. l. about 55. Ltr. $\begin{array}{c}4\text{-}5\\\hline 1\\\hline 11\text{-}12\end{array}$.

Height 6.7—9.2, 8—11 in length with caudal. Head 2.5—2.6, 3—3.1 in length with caudal. Eye 3.6—4.4, 1.4—1.5 in snout. Interorbital space narrow, flat between the supraorbital ridges, 4.2—5.2 in eye. Maxillary reaching to below frontborder of eye or a little further. Villiform bands of teeth in the jaws, two separate oval patches of pointed teeth on vomer and in a long double or triple row on palatines. Anterior and posterior nostrils with an elevated rim, the anterior one with a flap. Two serrated, longitudinal ridges between the nostrils of both sides, converging into one and continued on interorbital space to above middle of eyes. A strong spine before eye. Supraorbital ridge smooth in its anterior part, finely serrated from above frontborder of pupil to its end and continued without interruption into the superior postorbital ridge which is serrated and has sometimes two spines at its end. Inferior postorbital ridge connected with the superior one by the serrated posterior orbital rim, serrated in its anterior part and bordering a round fontanel between the inferior and superior ridges; about 3 spines in its posterior part, the last suprascapular spine in line with the lateral line, the 3 or 4 anterior scales of which are spiny. Suborbital ridge finely serrated in its entire course, ending in a long and strong preopercular spine which reaches end of opercle. A small spine at base of preopercular spine. Two spines below the preopercular spine, the upper one half as long as the preopercular spine, the lower one much smaller. A strong antrorse spine some distance in front of it. Two diverging ridges on opercle, each ending in a spine. Opercle and preopercle with ctenoid scales, head otherwise naked. About 8—10 rows of scales before dorsal. First dorsal spine more or less than vertical diameter of eye, separated by a low membrane from the rest of the fin. Third dorsal spine longest, equal to postorbital part of head. Longest dorsal rays about as long as 4th spine or somewhat longer. Anal less deep than second dorsal. Pectorals rounded, somewhat longer than postorbital part of head, the median rays forked. Ventrals as long as snout and eye or as long as head without snout, reaching on anal. Caudal rounded. Scales of upper side ctenoid, of breast cycloid. Colour of preserved specimens brownish above, light below, with indistinct, broad, darker transverse bands on the back and tail. Distal half of first dorsal dark. Second dorsal with faint, longitudinal rows of spots on the rays. Caudal dusky distally. Pectorals spotted, ventrals dusky in their distal half. Length 178 mm. (Type in Paris Museum and specimens of Bleeker's collection in the Amsterdam Museum examined).

Habitat: Singapore; Bali; Lombok!; Celebes (Makassar, Menado!); Ternate; Batjan; Buru; Ambon; New Guinea! — Seychelles, Gulf of Aden, Gulf of Oman, Ceylon, Philippines, Queensland. In sea.

Note. I examined in the British Museum the fish from Menado, recorded by A. B. Meyer, l.c., as *P. asper* C. V. It is not this species but *P. pristiger*. *P. asper,* of which I examined the type in the Paris Museum, has a considerably broader interorbital space.

6. **Platycephalus scaber** (L)

Cottus scaber Linné, Syst. Nat. Ed. 10. 1758, p. 264.
Cottus scaber Bloch, Ausländ. Fische II, 1786, p. 159.
Platycephalus scaber Bloch, Schneider, Syst. Ichth. 1801, p. 58.
Platycephalus scaber Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 249.
Platycephalus suppositus Troschel, Wiegmans Arch. Naturgesch. 1840, p. 269.
Platycephalus neglectus Troschel, ibid, p. 272.
Platycephalus scaber Bleeker, Verh. Bat. Gen. XXII. Scleroparei, 1849, p, 6.
?*Platycephalus neglectus* Günther, Cat. Brit. Mus. II, 1860, p. 187.
Platycephalus neglectus Kner, Novara Exp. Fische, 1865—1867, p. 123.
Platycephalus scaber Sauvage, Nouv. Arch. Mus. Hist. Nat. IX, 1873, p. 59.

Platycephalus scaber Day, Fishes of India, Part II, 1876, p. 275.
Platycephalus scaber Bleeker, Verh. Akad. Amsterdam XIX. Révision Platycephalus, 1879, p. 14. Atl. Ichth. IX, 1879, Tab. 419. Fig. 5.
Platycephalus scaber Sauvage, Poissons de Madagascar, 1891, p. 305.
Platycephalus neglectus Jordan & Seale, Proc. Davenport Acad. Sci. X, 1910, p. 15.
Thysanophrys scaber Seale, Philipp. Journ. Sci. V, No. 4, 1910, p 287.
Platycephalus scaber Barnard, Ann. S. Afric. Museum XXI, Part 2, 1927, p. 935.
Thysanophrys scaber Fowler, Journ. Bombay Nat. Hist. Soc. XXXIII, 1928, p. 117.
Thysanophrys neglectus Wu. Contr. Biol. Lab. Sc. Soc. China. Zool. Ser. VII. No. 1, 1931, p. 35.
Platycephalus scaber J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 379.
Grammoplites scaber Munro, The marine and fresh water fishes of Ceylon, 1955, p. 251.

D^1. IX. D^2. 12. A. 12. P. 1. 10. 8 or 1. 11. 7. V. I. 5. Sq. l. 85—87. Ltr. $\begin{array}{c} 5\text{-}6 \\ \hline 1 \\ \hline 14\text{-}15 \end{array}$.

Height 8.1—9.3, 9.2—10.4 in length with caudal. Head 2.9—3.1, 3.3—3.5 in length with caudal. Eye 6.5—6.7, 2—2.1 in snout. Interorbital space flat between the supraorbital ridges, relatively broader in large than in small specimens, equal to or less than eye. Maxillary reaching to below anterior half of eye. Villiform teeth in the jaws, in two oval patches on vomer and in a narrow elongated band on palatines. Anterior nostrils with a flap, posterior nostrils with a low tube or rim. No nasal spines. Supraorbital ridge with a strong spine in front of eye, smooth above middle of eye, serrated in its posterior part, continued as fan like diverging low ridges, the central one of which forming the superior postorbital ridge which has 2—4 spines in its posterior part. Inferior postorbital ridge low, with about 4 distant spines, ending in the larger suprascapular spine, behind which 53—57 scales of the lateral line each have a well developed spine. Suborbital ridge low with one or more small spines in front of eye, a spine below middle of eye and another behind eye; from this point the ridge is somewhat deflected and ends in the preopercular spine; this part of the ridge either smooth or with several spines. A short spine above base of preopercular spine which does not reach gill opening. Two shorter spines below it. Preopercle with rather large, cycloid, keeled scales; opercle with similar, but less distinctly and smaller scales, especially those along superior and posterior borders of the bone. Head above without scales. About 10 rows of scales before dorsal. First dorsal spine small, connected by a low membrane to the second which is somewhat shorter than the third and longest spine. Third spine as long as snout and half eye. Anterior rays of second dorsal not much shorter than longest spines. Anal less deep than second dorsal. Pectorals rounded, as long as snout and half eye. Fifth ventral ray simple, fourth longest and nearly as long as head without snout. Caudal rounded. Colour of preserved specimens brownish above, lighter below, back and sides indistinctly banded. First dorsal with very small brown spots, more crowded along the border of the fin, forming a more or less distinct dark band. Ventrals with similar spots. Second dorsal, anal, and caudal with more or less developed rows of brown spots. Length 260 mm. (Specimen of Bleeker's collection examined in the Amsterdam Museum).

Nomen indig: Muntu kerkau (Indonesia), Tekeh (Java), Muntu kerbo (W. Java), Badji badji (Jakarta, South Borneo), Petok (Central Java), Pahat (East Java), Mangada, Paha paha (Madura), Badukan (East Sumatra).

Habitat: Singapore; Sumatra (Trussan, Padang, Priaman, Siboga, mouth of Rokan River); Nias; Banka; Java (Jakarta, Bantam, Tegal, Semarang, Surabaya, Palabuan); Borneo (Serawak, Sandakan, mouth of Kapuas River); Madura; Celebes (Makassar); Sulu Ilands! — Coasts of Natal and Zululand, Madagascar, Réunion, Balutschistan, India, Ceylon, Andamans, Siam, Indochina, Formosa, China. In sea and estuaries.

7. **Platycephalus tuberculatus** C. V.

Platycephalus tuberculatus Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 258.

Platycephalus tuberculatus Günther, Cat. Brit. Mus. II, 1860, p. 186.

Platycephalus tuberculatus Day, Fishes of India, Part II, 1876, p. 275.

Platycephalus tuberculatus Max Weber, Abh. Senckenb. Naturf. Ges. XXXIV, 1911, p. 47.

Insidiator tuberculatus Mc Culloch, Endeavour Sci. Res. II, Part 3, 1914, p. 142.

Thysanophrys tuberculatus Fowler & Bean, Proc. U. S. Nat. Mus. LXII, 1922, Art. 2, p. 65.

?*Sorsogona serrulata* Herre, Notes Fishes Zool. Mus. Stanford Univ. 1. Fishes Herre Exp. 1931. 1934, p. 67. — Bull. Raffles Mus. No. 16, 1940, p. 49.

Platycephalus tuberculatus J. L. B. Smith, The Sea Fishes of S. Africa. 2nd impress. 1950, p. 379.

Suggrundus tuberculatus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 252.

D^1. VIII—IX. D^2. 11—12. A. 11. P. 2. 11. 7. V. I. 5. L. l. 52—54. Ltr. $\begin{array}{c}5\\\hline 1\\\hline 11\end{array}$.

Height 6.7—7.5, 8—8.8 in length with caudal. Head 2.6—2.75, 3.2 in length with caudal. Eye 3.8—4.4, 1.25—1.3 in snout. Interorbital space concave, 2.5—2.6 in eye. Anterior nostril with a flap. Maxillary reaching about below frontborder of pupil. Villiform teeth in jaws, in 2 patches on vomer, and on palatines. The teeth on symphysis of upper jaw, on posterior part of vomer, and on palatines, enlarged. Two serrated ridges on snout, beginning between anterior nostrils, converging backward into one, and ending at beginning of interorbital space. A low preorbital spine. Supraorbital ridge denticulated, two to five strong spines on anterior orbital rim. Superior and inferior postorbital ridges denticulated, lastnamed ending in two suprascapular spines which form the beginning of a row of somewhat curved spines, one on each of the 15—20 anterior scales of the lateral line. These spines gradually decreasing in size posteriorly. Suborbital ridge finely denticulated, some of the denticulations bifid, ending in the rather strong preopercular spine which does not reach gill opening. Two or three smaller spines below it. Opercle with two spines, the lower one at the end of a longitudinal denticulated ridge, which crosses the middle of the bone. All the bones rugose. Head scaleless above, opercle and preopercle scaled, these scales partly rudimentary, converted into spiny tubercles. First dorsal spine small, third longest and about equal to or slightly shorter than postorbital part of head. Dorsal rays slightly longer than longest spines. Anal less deep than second dorsal. Pectorals rounded, as long as snout and eye, the median rays forked. Ventrals with the fifth ray simple, the fourth longest, reaching anal. Caudal rounded. Scales of upper part ctenoid. Colour of preserved specimens brownish above, with traces of darker cross bands on body and tail. Dorsals with faint transverse bands, caudal, pectorals, and ventrals more or less spotted. Length 500 mm. (Type in Paris Museum examined).

Habitat: Singapore?; Aru Islands! — Red Sea. Coast of Natal, Maldives, coasts of India!, Ceylon, Formosa, Philippines?, Queensland.

Note. Judging from the description *Sorsogona serrulata* Herre belongs to this species.

8. **Platycephalus rodericensis** C. V.

Platycephalus rodericensis Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 253.
Platycephalus timoriensis Cuvier & Valenciennes, ibid. p. 254.
Platycephalus scaber Günther, Cat. Brit. Mus. II, 1860, p. 187 (nec L.).
Platycephalus macracanthus Bleeker, Versl. Akad. Amsterdam (2) III (1867), 1869, p. 253.
Platycephalus rodericensis Sauvage, Nouv. Arch. Museum IX, 1873, p. 58.
Platycephalus macracanthus Day, Fishes of India, Part II, 1876, p. 276.
Platycephalus macracanthus Bleeker, Verh. Akad. Amsterdam XIX. Révision Platycephalus, 1879, p. 22.
Platycephalus macracanthus Bleeker, Atl. Ichth. IX, 1879. Tab. 419. Fig. 1.
Platycephalus rodericensis Sauvage, Poissons de Madagascar, 1891, p. 306.
Platycephalus macracanthus Jordan & Seale, Bull. Bur. Fish. XXVI (1906), 1907, p. 38.
Platycephalus macracanthus Max Weber, Siboga Exp. Fische, 1913, p. 508.
Insidiator macracanthus McCulloch, Endeavour Sci. Res. II, Part 3, 1914, p. 141.
Thysanophrys macracanthus Fowler & Bean, Proc. U. S. Nat. Mus. LXII, 1922, Art. 2, p. 65.
Thysanophrys macracanthus Fowler, Journ. Bombay Nat. Hist. Soc. XXXIII, 1929, p. 117.
Suggrundus (Repotrudis) macracanthus Whitley, Great-Barrier Exp. Brit. Mus. Sci. Rep. IV, No. 9, 1932, p. 310.
Suggrundus macracanthus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 252.

D^1. IX. D^2. 1. 11. A. 1. 11 or 12. P. 2. 12. 7 or 2. 11. 8. V. I. 5. Sq. l. 73—84. Ltr. $\begin{array}{c}5\text{-}6\\ \hline 1\\ \hline 14\text{-}15\end{array}$.

Height 8—8.4, 9.7—10 in length with caudal. Head 2.7—3, 3.2—3.6 in length with caudal. Eye 4.5—4.8, 1.4—1.5 in snout. Interorbital space concave, 2.3—2.5 in eye. Maxillary reaching to below anterior part of eye. Villiform teeth in the jaws, in two patches on vomer and in narrow bands on palatines. Anterior nostrils with a flap, posterior nostrils with a short tube. A minute spine between them. Supraorbital ridge low, with a rather strong spine above frontborder of eye and four or five above posterior half of eye and beyond. Superior postorbital ridge with two spines, several low ridges spreading fan like behind the first of these spines. All bones of head rugose. Inferior postorbital ridge with 4 spines and an elongated one at its posterior end, which is in line with the spines on the anterior 17—20 scales of the lateral line. Suborbital ridge low, with a spine at its beginning before eye, another below middle of eye, and a third below posterior part of eye. Behind this spine the ridge is somewhat deflected and bears three spines; it is flanked here by a low denticulated ridge. A long and strong, somewhat curved preopercular spine, reaching on base of pectoral, a short spine superiorly at its base, and two spines below it. Opercle with two diverging ridges, ending in spines, a few small spines on the anterior part of the lower opercular ridge. Opercle and preopercle with more or less rudimentary scales, those along the hindborder of the bone normal and ctenoid. Head otherwise without scales. Nine or ten rows of scales before dorsal, 3 or 4 of which, nearest to dorsal, normal, the others rudimentary. First dorsal spine small, connected by a low membrane to the second which is as long as the fourth. Third spine longest, equal to snout and eye; last spine as long as first. Anterior dorsal rays scarcely shorter than longest spines. Anal less deep than second dorsal. Pectorals rounded, about as long as prostorbital part of head. Fifth ventral ray simple, fourth longest, equal to postorbital part of head and half eye. Caudal slightly rounded. Scales of upper part ctenoid, of lower parts cycloid. Anterior part of lateral line spiny. Colour of preserved specimens brown above, lighter below. First dorsal with rows of brown spots. Second dorsal, anal, and caudal hyaline; pectorals and ventrals with minute black spots. Length 204 mm.

Habitat: Singapore; Sulu Islands! Ambon; Timor! — Réunion, Bombay, Madras, Ceylon, Formosa, Philippines, coasts of Queensland. In sea.

Note. I have examined the types of *P. rodericensis* and *P. timoriensis* in the Paris Museum. As has been stated by Sauvage (l.c. 1891) *timoriensis* is a synonym of *rodericensis*; the types of both species are small, that of *P. timoriensis* is 81.5 mm in total length and that of *P. rodericensis* 100 mm, and I think that the differences I find between them and *P. macracanthus* may be attributed to their youth. In both species I count but 19 rays in the pectorals, whereas *P. macracanthus* has 21 rays (but McCulloch l.c. gives P. 19—20, and Day l.c. P. 23). The posterior teeth on the vomer are long and curved and not all villiform as in *P. macracanthus*. The ridge, flanking the posterior spines on the suborbital ridge is not denticulated, but smooth. The anterior 8—12 scales of the lateral line are spiny. Otherwise *P. rodericensis* and *P. timoriensis* agree with *P. macracanthus,* also in the presence of a few low spines on the lower opercular ridge.

McCulloch l.c. noted two marked forms among 32 specimens from Queensland, differing in the strength of the spines on the suborbital ridge, and in colour. He suggests that these may be sexual differences.

9. **Platycephalus oligolepis** Regan (Fig. 36, p. 133)

Platycephalus spinosus Günther, Zool. Challenger Exp. VI, 1880, p. 42 (nec Schlegel).
Platycephalus oligolepis Tate Regan, Trans. Linn. Soc. London (2) XII, Part 3, 1908, p. 238.
Platycephalus grandisquamis Max Weber, Siboga Exp. Fische, 1913, p. 509 (nec Regan).
Thysanophrys grandisquamis Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 301 (nec Regan).

D^1. VIII. D^2. 11. A. 11. P. 2. 8. 8. Ll. 29—34. Ltr. $\frac{\overset{2}{1}}{6}$.

Height 5.6—6.2, 6.8—7.6 in length with caudal. Head 2.4—2.5, 2.9—3.1 in length with caudal. Eye 3.5—3.9, somewhat longer or shorter than snout, about 4—6 times the concave interorbital width. Maxillary reaching to below anterior third of eye. Bands of villiform teeth in the jaws, in two small patches on vomer and in a narrow band on palatines. Anterior nostril with a flap. Two parallel low ridges between right and left nostrils, continued in the supraorbital ridges, each with 2 or 3 spines. Anterior orbital rim elevated, with 2—4 spines. Supraorbital ridge with 10—12 crowded spines. Superior postorbital ridge with 3—4 spines. Anterior part of inferior postorbital ridge with 5 or 6 spines, separated from the posterior part, which is more medial, and which has 3 spines, the posterior ones largest and in line with the lateral line, the two anterior scales of which have a spine. Preorbital with three diverging spines, directed forward. Suborbital ridge with crowded spines, regularly arranged, except below middle of eye where one or two spines have longer bases. The last spine is at the base of the pointed preopercular spine which extends on opercle as far as its scaled part; below it are two spines, the second of which is minute. Opercle with two strong, pointed spines. Opercle and preopercle scaly. Head ontherwise naked. About 5 rows of scales before dorsal. First dorsal spine less than half length of second, third longest and equal to postorbital part of head. Anterior longest rays of second dorsal about as long as longest spines. Anal less deep than second dorsal. Pectorals rounded, slightly less than eye and snout. Ventrals reaching on anal, about as long as head without snout. Caudal truncate. Scales of upper parts ctenoid, of lower parts cycloid. Colour of preserved specimens light brown above, whitish below.

Back and sides with traces of darker cross bands or with light bands bordered with dark. Head with more or less distinct dark spots, sometimes arranged on occiput in two parallel transverse rows, bordering a darker area. Distal part of first dorsal dusky. Base of pectorals dusky; ventrals with one, two, or three blackish cross bars, generally on the fourth and fifth rays only. Length 100 mm. (Type of the species in the British Museum and of *P. grandisquamis* Max Weber in the Amsterdam Museum, examined).

Habitat: Off N. W. New Guinea, 32 m!; S. of New Guinea!. — Cargados Caragos, 20—30 fathoms!

Note. Max Weber described this species as new as *P. grandisquamis,* unaware of the fact that Regan had described it before as *P. oligolepis.* In the same paper Regan described another new species as *P. grandisquamis,* which is different from Weber's species.

I have examined the specimen, recorded by Günther l.c. as *P. spinosus* Schl. It belongs to *oligolepis* and not to *P. spinosus* which is only known from China and Japan.

10. **Platycephalus horai** de Bfrt

Platycephalus horai de Beaufort, Proc. Nat. Inst. Sci. India 22, B, No. 2, 1957, p. 83.

Platycephalus grandisquamis Max Weber, Siboga Exp. Fische, 1913, p. 509 (pro parte).

D^1 VIII. D^2. 12. A. 12. P. 2. 10. 4. V. I. 5. Ll. 50. Ltr. $\begin{array}{c} 2\frac{1}{2} \\ \underline{1} \\ 11 \end{array}$.

Height 8.3, 10.4 in length with caudal. Head 2.6, 3.3 in length with caudal. Eye with a minute simple tentacle above pupil, 3.7, 1.2 in snout and 5.5 times the concave interorbital space. Maxillary reaching to below anterior border of pupil. Bands of villiform teeth in the jaws, in two small triangular patches on vomer, and in a narrow band on palatines. Anterior nostril with a short flap. Two spines between the anterior nostrils. One strong spine on elevated anterior orbital rim. Supraorbital ridges each with 12 or 13 crowded spines, diverging behind eyes and continued as superior postorbital ridges, which have 3—5 spines, the last one or the two posterior ones somewhat separated from the others. Anterior part of inferior postorbital ridge with 4 spines, the first immediately behind eye and more erect than the others, separated from the posterior part, which is more medial, and has three spines, the last in line with the lateral line, the two anterior scales of which have a spine. Preorbital with three diverging, flat spines, directed forward. Suborbital ridge with three small spines in front of eye, one below middle of eye, and five behind eye, the last of which at the base of the rather strong preopercular spine which is as long as pupil; below it two spines, the second of which is very small. Opercle with two strong spines. Opercle and preopercle scaly, head otherwise naked. About 7 rows of scales before dorsal. First dorsal spine small, third longest, almost one third of diameter of eye longer than postorbital part of head. Anterior longest dorsal rays as long as longest spine. Anal less deep than second dorsal. Pectorals as long as postorbital part of head. Ventrals almost as long as head without snout. Caudal slightly rounded. Scales ctenoid above, cycloid below. Colour of preserved specimens yellowish above, lighter below, back and sides with traces of brown transverse bands, one below first dorsal more distinct. First dorsal with a broad subterminal, longitudinal band, other fins more or less spotted with dark. Lentgh of two specimens 41 and 68 mm.

Habitat: Off New Guinea, 32 m.!

Note. Among the six specimens M. Weber, l.c., recorded as *P. grandisquamis* n. sp. (see *P. oligolepis*) I found two specimens which differ considerably from the others and which belong to a new species.

11. **Platycephalus sculptus** Gthr

Platycephalus sculptus Günther, Zool. Challenger Exp. VI, 1880, p. 41.
Platycephalus sculptus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 301.

D^1. IX. D^2. I. 10. A. 12. P. 2. 11. 5. V. I. 5. Ll. 70. Ltr. $\frac{5}{\underset{13}{1}}$.

Height 8.1, 9.6 in length with caudal. Head 2.8, 3.5 in length with caudal. Eye 4.6, 1.3 in snout. Interorbital space slightly concave, 2.8 in eye. Maxillary reaching to below anterior part of eye. Villiform teeth in the jaws, in two oval patches on vomer and in narrow bands on palatines. Anterior and posterior nostrils with a rim, the anterior ones with a flap. No spines between anterior nostrils. A spine in front of eye. Supraorbital ridge very low, with 5 recumbent spines and a sixth one at a short distance behind them. From this last spine ridges diverge fanlike backwards; there is no prominent superior postorbital ridge but it is indicated by a spine at its posterior end. The inferior postorbital ridge consists of 4 spines. Preorbital without distinct spines. Suborbital ridge with a spine below middle of eye, another below posterior border of eye, followed by 4 smaller ones, the last one above the base of the preopercular spine which is five seventh of the eye. A much shorter one and a still shorter one below it on preopercular edge. A fleshy flap below preopercular spine. Opercle with two flat spines, the lower one at the end of a low ridge. Opercle with ctenoid scales, preopercle and rest of head without distinct scales. Twelve to fourteen rows of scales before dorsal, the origin of which is slightly behind gill opening. First dorsal spine minute, second one scarcely longer than eye, third somewhat longer, fourth longest and equal to snout and eye. First and longest ray of second dorsal shorter than longest spine of first dorsal. Longest anal ray about as long as eye. Pectorals rather pointed, about as long as eye and snout. Ventrals much longer, as long as head without snout. Caudal slightly rounded. Scales of back and sides ctenoid, of belly cycloid. Lateral line without spines. Colour of preserved specimen reddish brown above, light buff on sides and belly. Sides with indistinct blotches the colour of the back. First dorsal dusky, second one lighter. Anal buff. Caudal dusky. Pectorals dusky, excepting a white, triangular, elongate patch in the upper half of the fin. Ventrals dusky. Length 211 mm (Description made after the type in the British Museum).

Habitat: Arafura Sea!

Note. Günther says that the anterior half of the lateral line is spiny, but in the type, examined by me in the British Museum, the lateral line is without spines, as is also the case in the figure, accompanying the description (Plate XVII, fig. A).

12. **Platycephalus cantori** Blkr

Platycephalus carbunculus Cantor, Journ. Asiat. Soc. Bengal XVIII (1849) 1850, p. 1021 (nec C. V.).

Platycephalus malabaricus Günther, Cat. Brit. Mus. II, 1860, p. 181 (pro parte, nec C. V.).

Platycephalus carbunculus Day, Fishes of India, Part II, 1876, p. 278 (nec C. V.).

Platycephalus Cantori Bleeker, Verh. Akad. Amsterdam XIX, 1879. Révision Platycephalus, p. 26.

D^1. IX. D^2. I. 11. A. 12. P. I. 14. 3. V. I. 5. Ll. about 68.

Ltr. $\frac{5}{\frac{1}{16}}$.

Height 6.75, 8.25 in length with caudal. Head 3, 3.66 in length with caudal. Eye 3.9, 1.17 in snout. Interorbital space 4.6 in eye, narrow and concave on account of the elevated supraorbital ridges.

Maxillary reaching to below front border of eye. Villiform teeth in the jaws, on the vomer in two patches, close together, in elongate bands on palatines. A spine, with a minute one in front of it, above anterior nostril; another spine above posterior nostril. A rather large spine on anterior orbital rim. Supraorbital ridge entirely finely serrated. Superior postorbital ridge with four crowded, rather small spines anteriorly and a single large spine posteriorly. Inferior postorbital ridge with two small spines anteriorly, three spines in its middle and three rather large and more distant spines posteriorly. Suborbital ridge with a spine at its beginning, a pair of small spines before eye, another similar pair below anterior half of eye, a rather large spine below posterior border of eye, followed by a row of small crowded spines and ending in the rather long, pointed preopercular spine. Two smaller spines below it. No interopercular flap. Scales before dorsal small, extending forwards in a point to posterior part of interorbital space. The two anterior scales of the lateral line are spiny, a few behind them have a low keel. First dorsal spine half as long as eye, the fourth spine longest and almost thrice the length of the first one. First dorsal ray simple, the others forked. Anal rays broken in the specimens examined. Fourteen rays of the pectoral forked. Origin of ventrals below origin of first dorsal. Preopercle and opercle with ctenoid scales. Scales ctenoid, except those of belly which are cycloid. Colour of preserved specimens (skins) yellowish. A brown saddle or band on back below posterior part of first dorsal, a narrow one below anterior part of second dorsal, a broader one below posterior part of second dorsal and another one on caudal peduncle. A few indistinct brown blotches on sides of body. Posterior and upper part of first dorsal blackish. Pectorals with indistinct rows of dark spots, the other fins more or less hyaline. Length of the two specimens described, the type and cotype of the species in the British Museum, 165 mm.

Habitat: Singapore. — Western coast of India, Madras, Pinang.

Note. Cantor described this species as *P. carbunculus* C. V. from Pinang, but lastnamed species, the type of which I examined in the Paris Museum, is different. Günther united *carbunculus* C. V. and *carbunculus* Cantor with *malabaricus* C. V. However, *malabaricus*, the type of which I also examined in the Paris Museum, is a synonym of *crocodilus*, as has already been stated by Day (Fishes of Malabar, p. 45). The only specimens Günther apparently examined of the species he calls *malabaricus* are one from the Moluccas and the specimens of Cantor's collection which he wrongly mentions as "Types of *Pl. carbunculus*". Hence Bleeker, although he based his opinion on the descriptions of *malabaricus* and *carbunculus* only, was perfectly right in saying that Cantor's species was neither *carbunculus* nor *malabaricus* but represented a new species which he called *cantori*. The description given above is based on the types, two skins, of Cantor's collection in the British Museum. *P. cantori* is allied to *carbunculus* and *bataviensis,* differing from both in having the whole supraorbital ridge finely serrated. This characteristic it has in common with *P. polyodon,* the species Bleeker thought to be nearest to *cantori,* but *polyodon* has an antrorse spine on the interopercle and its suborbital ridge is finely serrated. It is not clear if Day saw specimens of what he calls *carbunculus,* but his description is based on that of Cantor and hence is referable to *cantori*. The only specimens known from the Indo-Australian Archipelago are those recorded by Duncker (Mitth. Naturh. Mus. Hamburg XXI, 1904, p. 153) from Singapore as *carbunculus*. Although he gives no description, the fact that he includes Cantor's *carbunculus* from Pinang in the habitat, makes it almost sure that his Singapore specimens are *cantori*.

13. **Platycephalus macrocephalus** M. Weber

Platycephalus macrocephalus Max Weber, Siboga Exp. Fische, 1913, p. 508.
Thysanophrys macrocephalus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 301.

D^1. VIII. D^2. 11. A. 11. P. 1. 11. 8 or 2. 9. 9. V. I. 5. Ll. 33—36.

Ltr. $\begin{array}{c}3\frac{1}{2}\\ \hline 1\\ \hline 8\text{-}10\end{array}$.

Height 6.2—7.4, 7.3—9.6 in length with caudal. Head 2.4—2.5, 2.8—3.3 in length with caudal. Eye 3.3—3.8, about equal to snout. Interorbital space concave, 3—4.5 in eye. Maxillary extending nearly to below middle of eye. Lower jaw but slightly projecting. Villiform teeth in the jaws, in two patches on vomer and in a narrow band on palatines. Nostrils with an elevated rim, the anterior one with a flap. Two pairs of spines on snout in the interspace between the right and left nostrils, the spines of the posterior pair closer together than those of the anterior pair. A single spine on the elevated anterior orbital rim. Supraorbital ridge smooth in its anterior part, with 7—8 crowded spines in its posterior part, continued as the low superior postorbital ridge which has one spine at its beginning and another at its end. Inferior postorbital ridge with six spines, followed by two spines on the anterior scales of the lateral line; the anterior and posterior parts of the inferior postorbital ridge are separated and not in line, the posterior portions being nearer to each other than the anterior parts. Three diverging preorbital spines. Suborbital ridge coarsely denticulated, ending in the strong preopercular spine which does not reach the posterior border of the opercle and which has two spines below it. Two strong spines on opercle. Preopercle and opercle with rudimentary scales, imbedded in the skin. About 8 rows of scales before dorsal, the anterior ones more or less rudimentary. A rather large, arborescent tentacle on eye above pupil. First dorsal spine as long as pupil, third spine longest, equal to postorbital part of head. Anterior dorsal rays as long as longest spine. Anal less deep than second dorsal. Pectorals as long as postorbital part of head. Ventrals reaching to or on anal, equal to snout and eye. Caudal rounded. Scales of upper side ctenoid, of lower side cycloid. Colour of preserved specimens brownish above, light below. Sides and back with large, transverse, dark bands or blotches, less distinct in larger specimens. First dorsal with a dark border, second dorsal faintly spotted, caudal dark at its base. Pectorals with rows of brown spots, ventrals with two transverse dark bands, one through its middle and the other subterminal, more distinct in young specimens. Length 90 mm.

Habitat: Bali Sea!, Straits Sapeh!; north of Waigeu!; southeren coast of Timor! In sea at depths of 36—141 m.

14. **Platycephalus malayanus** Blkr

Platycephalus malayanus Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 498.
Platycephalus malayanus Günther, Cat. Brit. Mus. II, 1860, p. 184.
?*Platycephalus variolosus* Günther, Fische der Südsee II, 1876, p. 167.
Platycephalus malayanus Bleeker, Verh. Akad. Amsterdam XIX. Révision Platycephalus, 1879, p. 27. — Atl. Ichth. IX, 1879, Tab. 419. Fig. 2.
Platycephalus pristiger Max Weber, Jenaische Denkschr. VIII, 1895, p. 108 (nec C. V.).
Insidiator malayanus McCulloch, Endeavour Sci. Res. Part 3, 1914, p. 140.
Thysanophrys malayanus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 301.
Platycephalus malayanus Hardenberg, Treubia XV, 1936, p. 375.
Platycephalus malayanus Herre, Bull. Raffles Mus. No. 16, 1940, p. 49.

D^1. IX. D^2. 11 (12). A. 12 (13). P. 2. 13. 5 or 2. 11. 7. V. I. 5.

Sq. l. 57—63. Ltr. $\begin{array}{c}4\\\hline 1\\\hline 20\end{array}$ or $\begin{array}{c}5\text{-}6\\\hline 1\\\hline 16\text{-}17\end{array}$.

Height 7.65—8.8, 9—10.5 in length with caudal. Head 2.6—3, 3.1—3.7 in length with caudal. Eye 4.6—5.2, 1.4—1.7 in snout. Interorbital space concave, 1.7—3.2 in eye. Both nostrils with a short tube, in the anterior ones produced into a flap. Two small spines between the anterior nostrils, each placed on a ridge, the two ridges converging and forming a single median ridge extending to between anterior parts of eyes; these ridges not distinct in young specimens. Maxillary reaching to below front border of eye. Bands of villiform teeth in the jaws, those of the upper jaw broader than those of the lower jaw. Vomerine teeth in two oval patches, palatines with a narrow band of teeth. A strong spine in front of eye. Supraorbital ridge smooth in its anterior part, serrated posteriorly from above middle of eye with about 7 serrations in young ones, 12—20 in adult specimens, not ending in fan like diverging ridges but continued as the superior postorbital ridge which has 3—5 spines. Inferior postorbital ridge with an anterior group of about 5 spines, the first of which is erect and immediately behind eye, the second group consists of three spines, the last one largest and in line with the lateral line, the first and second scales of which have a small spine. Suborbital ridge with or without a spine in front and with one or two spines below middle of eye and 3 or 4 in its posterior part. Three preopercular spines, the upper one less than half longest diameter of eye, the second one less than half the length of the first and the third minute. No antrorse spine. Subopercular border with a rounded not much pronounced skinny flap. Opercle with two flat spines. Preopercle and opercle with well developed ctenoid scales; head otherwise naked. About 11—13 rows of scales before dorsal. First dorsal spine small, third spine longest, as long as first ray of second dorsal and equal to postorbital part of head. Anal less deep than second dorsal, its posterior rays longest, less than or equal to snout. Pectorals rounded, as long as postorbital part of head or a little longer. Ventrals reaching on anterior rays of anal, fourth ray longest, more than head without snout. Caudal slightly rounded. Scales of upper parts ctenoid, of lower parts cycloid. Colour of preserved specimens brownish above, lighter below; a series of faint, dark blotches along sides of body and tail below lateral line. Head more yellowish with narrow, dark brown lines, several from eye over cheek, forming the borders of light brown bands. Some of these lines broken into spots, or encircling light, more or less distinct ocelli. Anterior part of back with similar dark spots. First dorsal with a wavy darker band or with brown marmorations. Second dorsal, caudal, pectorals, and ventrals with rows of brown spots on the rays. Anal with a row of similar spots on the distal end of the rays. Length 228 mm. (Specimens of Bleeker's collection in the Leiden Museum examined).

Habitat: Sumatra (Padang); Java (Karangbollong); Borneo (Sandakan); Ambon!, Banda!; New Guinea. — Philippines, Queensland, Samoa?. In sea.

Note. Karoli (Termeszetr. füzetek V, 1882, p. 17) records this species from Japan what is most probably erroneous. *P. variolosus* Gthr may be this species, but according to the description there are more scales in the lateral line.

15. **Platycephalus isacanthus** C. V.

Platycephalus isacanthus Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 246.
Platycephalus isacanthus Sauvage, Bull. Nouv. Arch. Mus. IX, 1873, p. 55.
Platycephalus isacanthus Bleeker, Verh. Akad. Amsterdam XIX. Révision Platycephalus, 1879, p. 20.
Platycephalus isacanthus Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 38.
Thysanophrys isacanthus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 301.
Platycephalus isacanthus Herre, Notes Fishes Zool. Mus. Stanford Univ. 1934, p. 66.
Levanaora isacanthus Roxas & Martin, Bur. Sci. Manila, Techn. Bull. 6, 1937, p. 183.

D^1. IX. D^2. I. 11 (12). A. 12. P. 2. 10. 7. V. I. 5. Ll. about 55—63. Ltr. $\begin{array}{c}7\text{-}8\\ \hline 1\\ \hline 13\text{-}14\end{array}$.

Height 7.8—8, 9.4—9.6 in length with caudal. Head 2.9—3.1, 3.5—3.8 in length with caudal. Eye 4.4—4.7, 1.3—1.4 in snout. Interorbital space concave, 3.3—4.2 in eye. Both nostrils with a short tube, the posterior border of that of the anterior nostril produced in a short tentacle. Two small spines between the anterior nostrils, each on a ridge, the two ridges smooth, parallel and continued posteriorly to interorbital space, where they bifurcate. Maxillary reaching to below front border of eye. Bands of villiform teeth in the jaws, on two semilunate patches on vomer and in long narrow bands on palatines. A moderate spine in front of eye. Anterior part of supraorbital ridge smooth, a spine above front border of pupil, followed at some distance by 6—9 spines, the last one larger than the others which form the beginning of the superior postorbital ridge which is smooth but ends in two moderate spines. Inferior postorbital ridge with six compressed spines, the second divided into a number of serrations in the larger specimen examined; the last one somewhat larger than the others, in line with the lateral line, the first and second scales or the first to fourth scales of which are provided with a very small spine. Suborbital ridge with three spines, one below middle of eye, another below hindborder of eye, and a third on base of upper preopercular spine which is small and about two fifths of eye. Another spine below it which is about half as long as the upper one. No antrorse spine. Subopercle with a well developed, triangular, skinny flap. Opercle with two flat spines, the inferior one at the end of a ridge. Preopercle and opercle with ctenoid scales. About 11—12 rows of scales before dorsal. First dorsal spine about as long as eye, connected by a low membrane to the following spines; second spine not much shorter than the third which is the longest and equal to postorbital part of head. Longest ray of second dorsal shorter than longest spine. Longest anal rays equal to snout. Pectorals rounded, as long as postorbital part of head or slightly longer. Ventrals not or just reaching anal, as long as head without snout or a little longer. Caudal slightly rounded. Scales of back and sides ctenoid, of lower side cycloid. Colour of preserved specimens umber brown, breast lighter. Spines and rays of dorsals ringed dark and light. Anal with a dusky terminal band. Caudal and pectorals with dark brown spots on rays and membranes, forming irregular cross bands. Similar but less distinct spots on ventrals. Description made after the typical specimens, long 141 and 164 mm, in the Paris Museum.

Habitat: Singapore: Buru!; Waigeu!; south of New Guinea. — Tourane, Macao, Phillipines, northern Australia.

16. **Platycephalus celebicus** Blkr

Platycephalus celebicus Bleeker, Nat. Tijdschr. Ned. Indië VII, 1854, p. 450.
Platycephalus celebicus Günther, Cat. Brit. Mus. II, 1860, p. 189.
Platycephalus celebicus Bleeker, Verh. Akad. Amsterdam XIX, 1879. Révision Platycephalus, p. 30. — Atl. Ichth. IX, 1879. Tab. 418. Fig. 1.

D^1. VIII. D^2. 12 (13). A. 13 (14). P. 2. 10. 6 or 2. 11. 5. V. I. 5. Sq. l. about 54. Ltr. $\frac{3}{\frac{1}{9\text{-}11}}$.

Height 8.1, 10 in length with caudal. Head 2.8, 3.4 in length with caudal. Eye 4, slightly less than snout. Interorbital space 4 in eye, narrow and very concave on account of the elevated supraorbital ridges. Maxillary reaching to below anterior half of eye. Villiform teeth in jaws, in two patches on vomer and in elongate bands on palatines. Two spines on anterior orbital rim. Supraorbital ridge smooth anteriorly, posteriorly densely serrated and bent outwards behind eye to form the superior postorbital ridge which is serrated anteriorly and has a few recumbent spines posteriorly. The inferior postorbital ridge has 4 recumbent spines. Between the inferior and superior postorbital ridges a cluster of spines. Suborbital ridge with a few denticulations anteriorly, smooth in its median part below eye, and again serrated in its posterior part. Preopercular spine rather short and with a broad base, two much smaller spines below it. No interopercular flap. About 9 scales before dorsal. Two anterior scales of lateral line spiny, the following three with very feeble spines. First dorsal spine less than half length of second, third spine longest, about equal to snout and eye. Dorsal rays forked, except the first one. Second dorsal about as deep as first dorsal, but deeper than anal. Anal rays all forked or the first one simple. Ten or eleven median pectoral rays forked. Caudal rounded. Scales ctenoid above, cycloid below. The specimens described have lost their colour, but according to Bleeker body and tail have irregular brown cross bands, first dorsal with a broad brown terminal band, the other fins more or less spotted with dark. Length 165 mm. (Specimens of Bleeker's collection in the Leiden Museum examined).

Habitat: Mentawei Islands; Celebes (Makassar, Menado, Tanawanko); Ambon; Aru Islands. — Philippines.

Note. Bleeker (l.c. 1879) mentions *P. pristis* Peters from Mozambique as a synonym of *celebicus,* but I am not convinced, as most authors describe *pristis* as having the 8 anterior scales of the lateral line spiny.

17. **Platycephalus carbunculus** C. V.

Platycephalus carbunculus Cuvier & Valenciennes, Hist. Nat. Poissons IX, 1833, p. 461.
Platycephalus bobossok Bleeker, Nat. Tijdschr. Ned. Indië II, 1860, p. 189.
Platycephalus maculosus Peters, Monatsber. Akad. Wiss. Berlin (1868) 1869, p. 258.
Platycephalus bobossok Bleeker, Verh. Akad. Amsterdam XIX. Révision Platycephalus, 1879, p. 23. Atl. Ichth. IX, 1879. Tab. 420. Fig. 5.
Thysanophrys bobossok Seale, Philipp. Journ. Sci. V, No. 4, 1910, p. 287.

D^1. VIII—IX. D^2. 11. A. 12. P. 2. 13. 2 or 3. 13. 2 or 2. 13. 3 or 3. 11. 4 Sq. l. 82—95. Ltr. $\begin{array}{c} 5\text{-}6 \\ \hline 1 \\ 15\text{-}16 \end{array}$.

Height 7.3—9, 8.6—10.7 in length with caudal. Head 3, 3.5—3.6 in length with caudal. Eye 3.8—4.2, 1-1.2 in snout. Interorbital space concave, narrow, 3.5—4 in eye. Maxillary reaching to below front border of eye. Villiform teeth in jaws, in two oval patches on vomer and in elongated bands on palatines. Anterior nostrils with a short flap, posterior ones with a short tube. A spine at the inner side of the anterior nostril, followed by some smaller ones. A spine in front of eye. Supraorbital ridge denticulated from above front border of pupil backwards, more densely so posteriorly, where the ridges diverge and are continued in the parallel superior postorbital ridges which bear 5 spines, the hindermost the longest. Inferior postorbital ridge with 6 spines, the first one, which is somewhat erect, immediately behind eye, the last, suprascapular one is followed by small spines on the 4 or 5 anterior scales of the lateral line. A small simple tentacle on eye, above middle of pupil. Suborbital ridge with a spine below front border of eye, another below middle of eye, and three to five postorbital ones, the last one at the upper base of the preopercular spine. Preopercular spine of moderate length, not reaching to gill opening. One or two spines below it. Two opercular spines. Postorbital part of head above, as well as preopercle and opercle scaly. About 12 rows of scales between dorsal and posterior end of superior postorbital ridges. First dorsal spine small, connected by a low membrane to the second which is slightly shorter than the third and longest one. Third spine equal to postorbital part of head. Longest dorsal rays about as long as longest spine. Anal less deep than second dorsal. Pectorals rounded, about as long as snout and eye. Fifth ventral ray simple, fourth longest, almost as long as head without snout. Caudal rounded. Scales of upper parts ctenoid, of lower parts cycloid or slightly ctenoid. Colour of preserved specimens light brown above, white below. Irregular darker, brown, transverse bands on body and tail and less distinct on head, where a dark brown blotch below eye is specially conspicuous. First dorsal with irregular bands and marmorations on its outer half, second dorsal with similar, but less distinct markings. Anal white or with longitudinal rows of dark spots. Caudal, pectorals, and ventrals with transverse rows of dark spots or bands. Length 170 mm.

Habitat: Singapore; Bintang; Banka; Java (Jakarta); Borneo (Sandakan); Celebes (Makassar!); Aru Islands! — Bombay!, Tonkin.

Note. I have examined the type of *P. carbunculus* in the Paris

Museum and found it to agree in all essentials with *P. bobossok*, including the small tentacle on the eye which, however, is difficult to detect and hence easily could be overlooked. In a list of fishes, known from Australia, Bleeker (Verh. Akad. Amsterdam II, 1855, p. 7) includes *P. carbunculus*. I cannot trace how he came to this record.

18. **Platycephalus bataviensis** Blkr

Platycephalus bataviensis Bleeker, Nat. Tijdschr. Ned. Indië IV, 1853, p. 460.
Platycephalus bataviensis Günther, Cat. Brit. Mus. II, 1860, p. 188. — Fische der Südsee II, 1876, p. 167.
Platycephalus bataviensis Bleeker, Verh. Akad. Amsterdam XIX, Révision Platycephalus, p. 21. — Atl. Ichth. IX, 1879, Tab. 420. Fig. 4.
Platycephalus punctatus Seale, Occas. Papers B. P. Bishop Mus. I, 1901, p. 123 (nec C. V.).
Insidiator bataviensis Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 380.
Inegocia bataviensis Herre, Notes Fishes Stanford Univ. 1934, p. 66.

D^1. IX. D^2. I. 11. A. I. 11—12. P. 2. 10. 7 or 2. 11. 6 or 2. 12. 5. V. I. 5. Sq. l. 75—80. Ltr. $\begin{matrix}6\\1\\12\end{matrix}$.

Height 8.7—10, 10.5—11.7 in length with caudal. Head 2.8—2.9, 3.3—3.5 in length with caudal. Eye 4.2—4.7, 1.1—1.4 in snout. Interorbital space concave, 3—4 in eye. Maxillary reaching to below front border of eye. Villiform teeth in the jaws, in two oval, elongated patches on vomer and in narrow bands on palatines. Both anterior and posterior nostrils with a low tube, that of the anterior nostril posteriorly produced into a small tentacle. A spine anteriorly on orbital rim. Supraorbital ridge serrated at least for its posterior part, ending in a spine and continued as some fan like radiating very low ridges; one of them, however, is strong and forms the superior postorbital ridge which has two spines; it is connected at its posterior end by a low, curved ridge with the inferior postorbital ridge which has 6 or 7 spines. Suborbital ridge with a weak spine below middle of eye and a stronger one below posterior border of eye, behind which it is somewhat deflected, ending in a long, slender spine on preopercular edge. One much smaller spine below it, and below it another still smaller one may be present or absent. A short skinny flap on subopercle, below preopercular spines. Two opercular spines, the lower one at the end of a low ridge. Preopercle and opercle covered with ctenoid scales, head otherwise naked.

13—14 rows of scales between head and dorsal. Origin of dorsal slightly behind upper end of opercular flap. The first spine small, the second slightly shorter than the third which is subequal to fourth and slightly shorter than eye and snout. Following spines decreasing in length to the ninth which is almost as long as the first spine. Second ray of second dorsal longer than longest dorsal spine. Anal considerably less deep than second dorsal. Pectorals rounded, about as long as snout and eye, a varying number of the median rays forked, the others simple. Fifth ventral ray simple, fourth longest, and more than snout and eye. Caudal slightly rounded. Scales of upper side ctenoid, of lower side cycloid. Lateral line unarmed. Colour of preserved specimens reddish brown above, light below. Upper side sometimes with indistinct irregular broad cross bands. Fins with more or less developed rows of brown spots, with exception of the anal which is white. Length 203 mm.

Habitat: Singapore; Nias; Java!; Lombok!; Celebes (Badjoa, Menado); Batjan: between the islands Loslos and "Gebroken Island", off coast of W. New Guinea! —Philippines, Marianas, Ponapé.

19. **Platycephalus crocodilus** Tilesius

Platycephalus crocodilus Tilesius, Krusenstein's Reise, 1812, Pl. LIX, fig. 2.
Platycephalus punctatus Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 243.
Platycephalus guttatus Cuvier & Valenciennes, ibd. p. 244.
Platycephalus malabaricus Cuvier & Valenciennes, ibid. p. 245.
Platycephalus punctatus Quoy & Gaimard, Voyage Astrolabe, Zool. III. Poissons, 1834, p. 682.
Platycephalus punctatus Bleeker, Nat. Tijdschr. Ned. Indië I, 1850, p. 25.
Platycephalus clavulatus Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850, p. 1020.
Platycephalus quoyi Bleeker, Nat. Tijdschr. Ned. Indië XII, 1856—1857, p. 206.
Platycephalus punctatus Günther, Cat. Brit. Mus. II, 1860, p. 180.
Platycephalus malabaricus Kner, Novara Exp. Fische, 1865—1867, p. 121.
Platycephalus fasciatus Günther, Ann. Mag. Nat. Hist. (4) X, 1872, p. 397.
Platycephalus punctatus Day, Fishes of India, Part II, 1876, p. 277.
Platycephalus Quoyi Bleeker, Verh. Akad. Amsterdam. Révision Platycephalus, 1879, p. 11. — Atl. Ichth. IX, 1879, Tab. 418, Fig. 2.
Platycephalus punctatus Bleeker, ibid. p. 13. — ibid. Tab. 418. Fig. 4.
Platycephalus punctatus Steindachner & Döderlein, Denkschr. Akad. Wien LIII, 1887, p. 259.
Platycephalus punctatus Nyström, Bihang K. Svensk. Vet. Akad. Handl. XIII. Afd. IV, No. 4, 1887, p. 25.
Platycephalus punctatus Sauvage, Poissons de Madagascar, 1891, p. 307.

Platycephalus punctatus Steindachner, Ann. Hofmus. Wien XI, 1896, p. 207.
Platycephalus punctatus Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 38.
Thysanophrys crocodilus Jordan & Richardson, Proc. U. S. Nat. Mus. XXXIII, 1908, p. 638.
Thysanophrys crocodilus Franz, Abh. Bayer. Akad. IV. Suppl. Bd. 1. Abth. 1910, p. 78.
Platycephalus crocodilus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 933.
Thysanophrys crocodilus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 300. — Journ. Bombay Nat. Hist. Soc. XXXIII, 1928, p. 116 (sine synon.)
Thysanophrys crocodilus Wu, Contr. Biol. Lab. Sci. Soc. China VII, 1931, p. 34.
Platycephalus crocodilus Fowler, Proc. Acad. Nat. Sci. Philadelphia LXXXVI, 1934, p. 488.
Coccius crocodilus Fowler, Hongkong Naturalist VI, Suppl. 1938, p. 37.
Platycephalus crocodilus J. L. B. Smith. The Sea Fishes of S. Africa. 2nd impress. 1950, p. 378.
Thysanophrys crocodilus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 253.

D^1. IX. D^2. 1. 10—11 (12). A. 1. 10. P. 2. 10. 8 or 1. 11. 8 or 2. 11. 7 or 2. 12. 7 V. I. 5. Sq. l. 90—108. Ltr. $\begin{array}{c}8\text{-}9\\ \hline 1\\ \hline 16\text{-}19\end{array}$.

Height 9—10.9, 10.1—13 in length with caudal. Head 2.8—2.9, 3.3—3.6 in length with caudal. Eye 4.1—4.9, 1.3—1.4 in snout. Interorbital space narrow and concave, 2.2—3.2 in eye. Maxillary reaching to below anterior border of eye or slightly more backwards. Villiform bands of teeth in the jaws, on the vomer in two oval, narrow, and elongated patches; on the palatines the small teeth are in two or three rows. Anterior nostril with a short tentacle, the posterior one with a short tube. Two spines between the anterior nostrils, not distinct in young. A well developed spine on front border of orbital rim, outside the supraorbital ridge which begins before eye and which is serrated in its posterior part, ending in fan like radiating low ridges, one of which forms the beginning of the superior postorbital ridge which has one spine. Inferior postorbital ridge with 4—8 spines. Suborbital ridge with 3 spines, one at its beginning before eye, one below middle of eye and one below posterior part of eye, where the ridge is slightly deflected downwards, ending in a long, slender spine on preopercular edge. A much shorter spine below it. Subopercle with a feebly developed flap below preopercular spines. Two opercular spines. Preopercle and opercle covered with ctenoid scales, head otherwise naked. About

14 rows of scales before dorsal. Origin of dorsal well behind posterior opercular flap, the first spine minute, connected by a low membrane to the second which is slightly shorter than the third and longest spine, the length of which is slightly more than snout and half eye. Following spines decreasing in size to the ninth which is small and sometimes inconspicuous. Second and third rays of second dorsal longest, slightly shorter than longest dorsal spines. The membranes between the rays somewhat incised. Anal lower than second dorsal. Pectorals rounded, as long as snout and eye, a varying number of the median rays forked, the rest simple. Ventrals pointed, the fifth ray simple, the fourth longest and equal to distance between anterior nostril and superior end of gill opening. Caudal rounded. Scales of upper side ctenoid, of lower side cycloid. Four or five spines along the anterior part of the lateral line. Colour of preserved specimens reddish brown, light below. Upper part of head, body and tail with black dots which are more or less regularly arranged along lateral line. First dorsal hyaline, its outer half with smoky brown marmorations. Rays of second dorsal with brown spots, forming longitudinal rows. Anal whitish. Pectorals and ventrals with transverse dark bands, in the pectorals formed by blotches on the rays, in the ventrals the membranes are dark banded too. Caudal hyaline with irregular transverse smoky brown bands. Length 330 mm.

Habitat: Pulu Weh!; Singapore; Sumatra (Benkulen); Nias!; Banka; Java (Jakarta); Borneo (Sandakan); North Celebes; Flores!; Timor; Ternate; Obi major!; Batjan; Ambon; Saparua; Arafura Sea; New Guinea; Mysore. — Natal and Zululand, Madagascar, Zanzibar, coasts of India, Ceylon, Andamans, Siam, Cochinchina, Malacca, China, Korea, Riu Kiu Islands, Japan, Philippines, Pelew Islands, Santa Cruz Islands, New Hebrides.

Note. Fowler (l.c. 1928) places *P. tentaculatus* Rüppell among the synonyms of this species. Although there is some doubt about the identity of *P. tentaculatus* (see *P. longiceps*), the presence of tentacles on the eyes and the short spines on the preopercular edge exclude it from the synonymy of *crocodilus*. I have examined typical specimens of *P. quoyi* of Bleeker's collection in the Leiden Museum. Bleeker says that *P. quoyi* is closely allied to *punctatus* (= *crocodilus*) but differs by having more numerous spines on the vertex and above the orbit, by lacking any spines on the lateral line, and by the presence of spots on the caudal, but the lateral line is not smooth in the specimens examined, one to three of the anterior scales having distinct spines. The upper part of the head may be a little more spiny than usual, but not enough to be of specific importance. There is no difference in the scale count. I do not think it possible to separate *crocodilus* and *quoyi*. *P. quoyi* has been recorded from New Guinea by Macleay, by A. B. Meyer from Mysore, by Steindachner from Ternate, and by Herre from the Philippines, but none of these authors gives a description of the species or remarks on the difference with *crocodilus*. In a note following the first description of *P. quoyi*, Bleeker says that the figure Quoy & Gaimard give of *P. punctatus* is possibly not that species but *quoyi*, whereas their description is that of *punctatus*. This question is of no importance if the two are identical.

20. **Platycephalus sundaicus** Blkr

Platycephalus sundaicus Bleeker, Verh. Akad. Amsterdam XIX. Révision Platycephalus, 1879, p. 18. — Atl. Ichth. IX, 1879. Tab. 419. Fig. 4.

D^1. IX. D^2. 12 (13). A. 12 (13) P. 1. 11. 7. V. I. 5. Sq. l. 84—95. Ltr. $\begin{array}{c}6\text{-}7\\ \hline 1\\ \hline 15\end{array}$.

Height 7.9—9.2, 9.3—10.9 in length with caudal. Head 2.8—2.9, 3.4—3.5 in length with caudal. Eye 4.4—4.5, 1.2 in snout. Concave interorbital space thrice in eye. Maxillary reaching to below middle of eye. Villiform teeth in jaws, in two patches on vomer and in elongate bands on palatines. One or two divergent spines on anterior orbital border. Supraorbital ridge smooth anteriorly and with about 4 serrations posteriorly. Fan like diverging ridges behind its posterior end, from which starts the superior postorbital ridge which has no other distinct spines than one at its end. Inferior postorbital ridge with about 4 recumbent spines. A blunt spine at the beginning of the suborbital ridge, another one below middle of eye, and three more between below posterior border of eye and preopercular spine which is as long as or somewhat shorter than eye. Two very small spines below it. Twelve to fourteen scales before dorsal. Three anterior scales of lateral line spiny. First dorsal spine nearly as long as diameter of eye. Third dorsal spine longest, as long as eye and snout. Soft dorsal less deep than first dorsal, but deeper than anal. Eleven median pectoral rays forked. Caudal rounded. Colour of preserved specimens reddish brown; a more or less distinct dark, cloudy patch on opercle. Dorsal and pectoral rays annulated dark and light. Caudal with dark spots. Length 140 mm. (A specimen of Bleeker's collection in the Leiden Museum examined).

Habitat: Singapore!; Sumatra; Java.

21. **Platycephalus bosschei** Blkr

Platycephalus Bosschei Bleeker, Nat. Tijdschr. Ned. Indië XXI, 1860, p. 140.
Platycephalus Bosschei Bleeker, Verh. Akad. Amsterdam XIX. Révision Platycephalus, 1879, p. 16. — Atl. Ichth. IX, 1879. Tab. 419. Fig. 3.
Platycephalus isacanthus Macleay, Proc. Linn. Soc. New S. Wales V, 1881, p. 585 (nec C. V.).
Insidiator bosschei McCulloch, Endeavour Sci. Res. II, Part 3, 1914, p. 139.

D^1. IX. D^2. 11 (12). A. 12 (13). P. 1. 11. 7 or 1. 11. 8. V. I. 5. Ll. about 100. Ltr. $\begin{array}{c}8\\\hline 1\\\hline 22\end{array}$.

Height 8.5—9.3, 9.5—11.2 in length with caudal. Head 3.2, 3.7—3.9 in length with caudal. Eye 6.1—6.2, 2 in snout. Concave interorbital space 1.1—1.5 in eye. Maxillary reaching to below front border of eye. Villiform teeth in jaws, in two patches on vomer and in elongated bands on palatines. A blunt spine on anterior orbital rim. Supraorbital ridge smooth, ending in a short, blunt spine. Superior postorbital ridge without distinct spines, but ending in a short, blunt one. Two short diverging ridges at its beginning. Inferior postorbital ridge with a rough upper surface, but scarcely spiny, ending in a blunt spine. Suborbital ridge with a bent below eye, without distinct spines. Preopercular spine short. Opercle and subopercle scaly. About 15 rows of scales before dorsal. Lateral line without spines. First dorsal spine very short. Longest dorsal spines equal to snout and eye, longer than dorsal rays which again are longer than anal rays. Eleven median pectoral rays forked. Caudal slightly rounded. According to Bleeker the colour of fresh specimens is greenish above, with numerous margaritaceous blotches on head, body, and tail. Lower side light. Caudal with brown spots and superiorly and inferiorly with large blackish blotches. Length 300 mm (Specimens of Bleeker's collection in the Leiden Museum examined).

Habitat: Singapore; Banka! — Philippines, North Australia.

Doubtful species

Platycephalus sumatranus Bennett

Platycephalus sumatranus E. T. Bennett. Cat. zool. spec. Memoir Life of Raffles, by his widow. 1830, p. 687.

Platycephalus sumatrensis Bleeker, Verh. Bat. Gen. XXII. Bijdr. kennis Scleroparei, 1849, p. 4.

Platycephalus sumatranus Bleeker, Acta Soc. Sci. Indo-Neerl. VIII. Achtste bijdr. kennis Vischfauna Sumatra, 1860, p. 40.

"Plat. capite elongato, cranio cristis spinosus quator; crista superciliaris antice 1-spinosa, postice serrata; infraocularis spina brevi acuta pone oculum alteraque brevi terminali. D $\frac{8}{10}$, 11. A. 11. C. 11."

Nothing more is known about this species which belonged to the collection made by Sir Thomas Raffles in Sumatra, than the short description copied above. Bleeker mentions this species twice in his lists, but says nothing about its validity or affinity. It is curious that in Bleeker's "Révision" of the genus *Platycephalus* the name *P. sumatranus* does not occur at all. Although Günther records more than once in the Catalogue of the British Museum species described by Bennett in the volume cited, and although the type specimens of seven species of Raffles's collection are present in the British Museum, no mention is made of *P. sumatranus.* Dr. Trewavas kindly informed me that no *Platycephalus* of that name is present in the British Museum, and as Bennett's description is too short to recognize the species, its status remains doubtful.

2. **Elates** Jordan & Seale

(Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 39.

Depressed. Body and tail and sides of head covered with small ctenoid scales. Narrow bands of teeth in the jaws, a single row of minute teeth on the palatines. Vomerine teeth larger, also in a single row. Lower jaw protruding beyond upper jaw. Head with well developed supraorbital, postorbital, and suborbital ridges which bear spines. A single very long preopercular spine. A single opercular spine. Two dorsals, the first with VI spines, the first of which is small and isolated from the second. Second dorsal beginning at some distance from the first dorsal, consisting of 13 or 14 rays. Anal beginning before second dorsal, with 12—14 rays. Median pectoral rays forked. Ventrals with one spine and 5 rays. Caudal forked, the upper lobe the longer.

Distribution that of the single species known.

1. **Elates ransonneti** (Steind.) (Fig. 37, p. 165)

Platycephalus ransonnetii Steindachner, Sitzber. Akad. Wien LXXIV, 1. Abth. 1876, p. 209.

Platycephalus ransonneti Bleeker, Verh. Akad. Amsterdam XIX, Révision Platycephalus, 1879, p. 19.
Elates thompsoni Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 39.
Elates thompsoni McCulloch, Endeavour Sci. Res. II, Part 3, 1914, p. 135.
Elates ransonnetti Herre, Bull. Raffles Mus. No. 16, 1940, p. 49.

D^1. VI. D^2. 13—14. A. 12—14. P. 19—21. V. I. 5. Ll. 82—99. Sq. l. 125—133.

Height 13.6—16. Head. 3.3—3.6. Eye 4.8—5.3, about twice in snout. Interorbital space concave, narrow, less than half pupil. Mouth small, maxillary reaching to below posterior nostril. No spines on snout. A rather strong spine before eye. Supraorbital ridge with 8—10 crowded spines in its posterior part. Superior postorbital ridge with two spines. Suborbital ridge with 3 small spines, one behind the level of the anterior nostril, the second below the pupil, and the last behind the hindborder of the eye. The long and strong preopercular spine reaches to or on pectoral and is longer than the eye. Occiput, opercle, and postorbital part of preopercle scaly. Lateral line without spines. First dorsal small and isolated, second dorsal spine longest, 2.6 in head. Distance between the two dorsals more than eye. Anterior 5 rays of second dorsal decreasing in length posteriorly as spines of first dorsal, following rays low and of nearly equal length. Anterior anal rays longest, less long than anterior dorsal rays. Pectorals somewhat rounded, 2.7 in head. Caudal forked, the upper lobe the longer and usually with one of its superior rays prolonged into a filament which may be longer than the rest of the fin. Colour in spirits yellowish, with wash of brown above; an indistinct broken longitudinal, brown band along side, a dusky blotch on opercle may be present. Dorsals and caudal with blackish spots, the lower lobe of caudal with two rather large elongate black blotches. Length 185 mm. (Compiled, not seen by me).

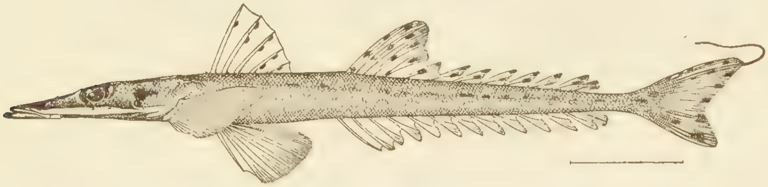

Fig. 37. *Elates ransonneti* (Steind.). After Jordan & Seale.

Habitat: Singapore. — Philippines, Queensland. In sea.

7. Family HOPLICHTHYIDAE

Much depressed. Head body, and tail without scales, but body and tail with bony plates which cover the back and the upper half of the sides, each plate with one or more spines. Two pairs of nostrils. Head with low bony ridges. Sides of head with laterally expanded spiny ridges. Minute teeth in jaws, on vomer and on palatines. Two dorsals, the first with flexible spines, the second, which is much longer, with soft rays. No anal spines. Anal long, about as long as second dorsal. Ventrals with a spine and 5 rays. Pectorals with the three (exceptionally four) lower rays detached. Gill membranes attached to the isthmus. Vertebrae 8 + 18. the first three vertebrae have sessile epipleurals, the next four or five have epipleurals inserted on short parapophyses.

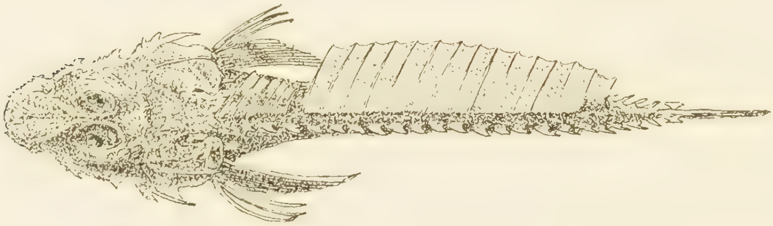

Fig. 38. *Hoplichthys citrinus* Gilbert. About nat. size.

1. **Hoplichthys** Cuvier & Valenciennes

(Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. xix)

Oplichthys Cuvier & Valenciennes, ibid. p. 264.
Monhoplichthys Fowler, Proc. U. S. Nat. Mus. LXXXV, 1938, p. 95.
Pristhoplichthys Fowler, ibid. p. 95, p. 99.
Rhinhoplichthys Fowler, ibid. p 95, p. 100.

For characters of the only genus, see those of the family.

Distribution. Several species from deep water in the Indo-Pacific.

1. **Hoplichthys citrinus** Gilbert (Fig. 38, p. 166)

Hoplichthys citrinus Gilbert, Bull. U. S. Fish. Comm. XXIII, Part II (1903) 1905, p. 640.
Hoplichthys citrinus Max Weber, Siboga Exp. Fische, 1913, p. 510.
Hoplichthys citrinus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 300.

D^1. V—VI. D^2. 15 (16).A. 17. p. I. 10. 2 + 3. V. I. 5.

Height 12—12.6, 13.7—14.8 in length with caudal. Head 3.1—3.2, 3.5—3.6 in length with caudal. Eye 3.7—3.9, 1.25—1.28 in snout. Interorbital space concave, 4—4.5 in eye. Maxillary not quite reaching to below front border of eye. Minute teeth in several rows in jaws, in two patches on vomer and in a few rows on palatines. Supraorbital ridge with minute spines, extending forwards as two divergent ridges on snout, where they enclose a median ridge, also with minute spines, bifurcating anteriorly to embrace the premaxillary peduncle. Superior postorbital ridges consisting of an anterior short part with a row of minute spines, followed by a median part, consisting of about 6 somewhat divergent low ridges with minute spines, and a posterior part with a row of small spines, but the last and the penultimate spines much stronger. Lateral profile of head formed by a sharp, spiny ridge, divided into 4 well marked lobes; the anterior lobe consisting of the laterally flattened preorbital which bears a row of spines, the posterior one largest. The three following lobes form the suborbital ridge and end in the long and curved preopercular spine. Each lobe has a row of horizontal spines, increasing in length posteriorly. Opercle with three divergent spiny ridges, the median one ending in a strong spine. Twenty seven lateral plates, each bearing a strong spine, which is directed backwards; a much smaller and more slender spine below each of them. Origin of dorsal scarcely behind gill opening, the first of the flexible spines said to be enlarged in males, as also some of the anterior rays of the soft dorsal. In females the longest rays of the second dorsal equal about postorbital part of head. Longest anal rays as long as snout. Free pectoral rays much shorter than the longest connected pectoral rays, about as long as postorbital part of head. Longest pectoral rays more than snout and eye. Ventrals originating well in front of pectorals, as long as postorbital part of head. Caudal truncate. Colour of preserved specimens light yellowish brown. First dorsal with a median dusky band. Length 175 mm.

Habitat: Timor Sea, 216 m! — Hawaii 218—414 m.

8. Family COTTUNCULIDAE

Tadpole shaped, the body tapering rapidly from the head to the slender tail. No scales. Head generally smooth, seldom spinous, but the spines covered by skin. Villiform teeth in jaws, present or absent on vomer, no teeth on palatines. One continuous dorsal, consisting of spines and rays, the spiny part shorter than the soft part, no notch between the two parts. Anal without spines, about as long as soft part of dorsal. Pectorals well developed, with a broad base, procurrent below. Ventrals with a spine and 2 or 3 rays. Gill membranes joined to isthmus. Vertebrae 10 + 18.

Distribution. Deep Sea fishes of the Atlantic, Indic, and Pacific. Two genera are generally recognized: *Cottunculus* and *Cottunculoides,* differing by the absence of vomerine teeth in the latter. In the species described below the vomer has but a few small teeth, and hence it is questionable if the genus *Cottunculoides* can be retained.

1. **Cottunculus** Collett

(Collett, Norges Fiske, Christiania, 1875, p. 20)

?*Cottunculoides* Barnard, Ann. S. Afric. Mus. XXI, part 2, 1927, p. 923.

For characters of the genus, see those of the family.

1. **Cottunculus gyrinoides** M. Weber (Fig. 39, p. 168)

Cottunculus gyrinoides Max Weber, Siboga Exp. Fische, 1913, p. 505.

Br. 8. D. 7. 17. A. 12. P. 23. V. I. 3.

Head deeper than body, its depth 3.36, 4 in length with caudal, its length 2.1, 2.6 in length with caudal. Head without spines. Eye 3.4.

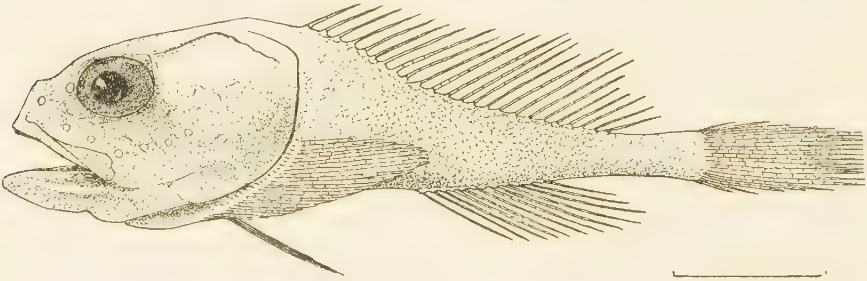

Fig. 39. *Cottunculus gyrinoides* M. Weber. After Weber.

Snout 1.3, interorbital space 1.2 in eye. Maxillary reaching to below middle. of eye. Villiform bands of somewhat hooked teeth in jaws. A few fine teeth on hindermost part of vomer. No teeth on palatines. Dorsal and anal covered by skin. No notch between spinous and soft part of dorsal. Dorsal spines flexible and soft. Longest dorsal rays as long as postorbital part of head. End of anal before that of dorsal. Pectorals reaching on anal, the longest rays as long as postorbital part of head; ventrals only slightly shorter. Colour of preserved specimen brown above, lighter below. Length 58 mm.

Habitat: Flores Sea, 794 m!
]

Note. The description is made after the type, 58 mm long. Both it and another specimen from the same locality are in poor condition, and several characteristics, such as the gill membranes being joined to the isthmus, could not be ascertained.

9. Family CARACANTHIDAE

Much compressed. Head deeper than long. Head, body and tail without scales, but densely covered with short papillae or tentacles, arranged in vertical rows on body and tail. Two pairs of nostrils. Small teeth in the jaws, none on the palate. One or two dorsals, the first with spines, the second which is much longer, with deeply forked rays. Two short, pungent anal spines. Pectorals short without detached rays. Ventrals rudimentary, with a spine and two rays, scarcely protruding beyond the papillae which cover the belly. Gill membranes attached to isthmus. Gill opening very narrow. Vertebrae 24. No ribs.

1. **Caracanthus** Krøyer

(Krøyer, Naturhist. Tidskrift I, 1844, p. 267)

Micropus Gray, Zool. miscell. 1831, p. 20 (preoccupied).
Amphiprionichthys Bleeker, Nat. Tijdschr. Ned. Indië VIII, 1855, p. 173.
Centropus Kner, Sitzber. Akad. Wien XXXIX, 1860, p. 531.
Crossoderma Guichenot, Nouv. Arch. Mus. V, 1869, p. 195.
Trachycephalus De Vis, Proc. Linn. Soc. New S. Wales VIII, 1883, p. 455.

For characters of the single genus, see those of the family.

Distribution: A few species from the Indo-Pacific.

Key to the Indo-Australian species of Caracanthus

a. Dorsal VII—VIII. 13—14, moderately notched between spinous and soft part. Colour uniform .	1. *C. unipinna* p. 169.
b. Dorsal VII—VIII. 12, deeply notched between spinous and soft part. Light with dark spots or dark with light spots	2. *C. maculatus* p. 171.

1. **Caracanthus unipinna** (Gray) (Fig. 40, p. 170)

Micropus unipinna Gray, Zool. miscell. 1831, p. 20.
Amphiprionichthys apistus Bleeker, Nat. Tijdschr. Ned. Indië VIII, 1855, p. 173.
Centropus staurophorus Kner, Sitzber. Akad. Wien XXXIX, 1860, p. 531.
Micropus unipinna Günther, Cat. Brit. Mus. II, 1860, p. 147.
Amphiprionichthys apistus? Kner, Sitzber. Akad. Wien LVIII, 1868, p. 309.
Amphiprionichthys Zeylonicus Day, Proc. Zool. Soc. London, 1869, p. 515. — Fishes of India, Part 1, 1875, p. 158.

Micropus unipinna Günther, Fische der Südsee I, 1873—1875, p. 86.

Caracanthus apistus Bleeker, Verh. Akad. Amsterdam XVI (1873) 1876. Mémoire Scorpénoides, p. 96. Atl. Ichth. Tab. 416. Fig. 5.

Trachycephalus Bankiensis De Vis, Proc. Linn. Soc. New S. Wales VIII, 1883, p. 456.

Micropus unipinna Alcock, Journ. Asiat. Soc. Bengal LXV, 1896, p. 313.

Micropus unipinna Steindachner, Abh. Senckenb. naturf. Ges. XXV, 1901, p. 424.

Amphiprionichthys unipinna Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 380.

Micropus apistus M. Weber, Siboga Exp. Fische, 1913, p. 488.

Caracanthus unipinna Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 299.

Caracanthus apistus Giltay, Mém. Mus. Roy. Hist. Nat. V, 1933, p. 112.

Caracanthus Zeylonicus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 375.

Caracanthus unipinna Herre, Philipp. Journ. Sci. 80, No. 4, 1952, p. 465.

Caracanthus unipinna Harry, Atoll. Res. Bull. 18, 1953, p. 160.

Caracanthus unipinnus Randall. Ibid. 47, 1955, p. 204.

D VII—VIII 13—14. A. II. 12. P. 12—13. V. I. 2.

Height 1.5—1.8, 1.9—2.2 in length with caudal. Head 2.6—2.9, 3.3—3.8 in length with caudal. Eye 3.7—4. Snout four fifths of eye or equal to eye in small specimens. Interorbital space very convex, three fifths or one half of eye. Posterior nostrils in the line connecting front borders of eyes, anterior nostrils closely before them, both with a short tube. Mouth oblique; maxillary reaching to below middle of eye or not quite so far. Preorbital with a short, anterior, and inner spine, directed forward, and a much longer posterior and

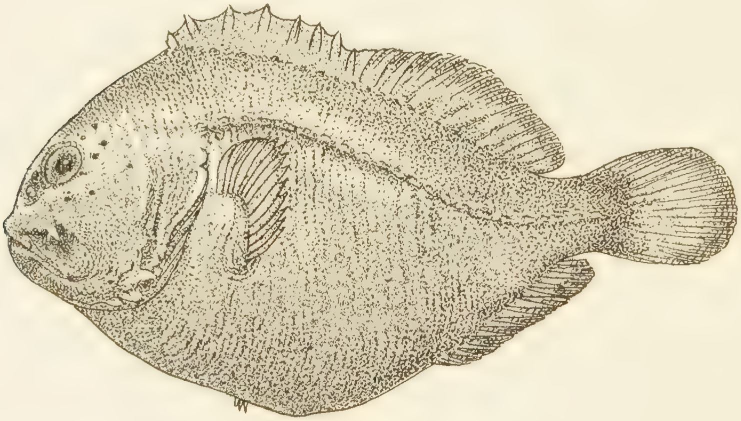

Fig. 40. *Caracanthus unipinna* (Gray). × 3.

outer spine directed sidewards. Hindborder of preopercle with 6—7 knob like spines. Interopercle with a single spine. Opercle with two knob like spines, close to each other. Origin of dorsal slightly before gill opening. Third and fourth spines longest, about equal to eye, last spine about one half of the longest spines. First dorsal ray about as long as longest spines. Anal spines very short, hidden amongst the papillae of the skin. Soft anal less deep than soft dorsal. Pectorals half of snout shorter than head. Caudal rounded. Colour of preserved specimens light brownish grey, the area between dorsal and lateral line a shade darker. Length 46 mm.

Habitat: Kabala dua, Borneo Bank!; Muaras Reef, Celebes Sea!; Celebes (Mamudju, Kwandang Bay!); Beo; Karakelang!; Buru; Ternate; Obi; Ceram; Ambon!; between Banda Neira and Gunung Api; Timor; New Guinea (Manokwari). — Port Alfred, Madagascar, Zanzibar, Mauritius, Chagos Archipelago, coast of Malabar, Ceylon, Andamans, Christmas Island, Cocos Keeling Islands, Pulu Tikus, Philippines, Pelew Islands, Marshall Islands, Santa Cruz Islands, New Hebrides, Gilbert Islands, Fiji, Vavau, Samoa, Society Islands, Tuamotu Islands, Hawaii.

On coral reefs, often dwelling in interstices of corals.

2. **Caracanthus maculatus** (Gray)

Micropus maculatus Gray, Zool. miscell. 1831, p. 20.
Caracanthus typicus Krøyer, Naturhist. Tidskrift I, 1844, p. 264, p. 267.
Micropus maculatus Günther, Cat. Brit. Mus. II, 1860, p. 147. — Fische der Südsee I, 1873—1875, p. 86.
Caracanthus maculatus Fowler, Proc. Acad. Nat. Sci. Philadelphia 1900, p. 515, p. 522.
Caracanthus maculatus Jenkins, Bull. U. S. Fish. Comm. XXII (1902) 1904, p. 491.
Caracanthus maculatus Jordan & Evermann, ibid. XXIII (1903) 1905, p. 453.
Caracanthus maculatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 299.
Caracanthus maculatus Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 266.
Caracanthus maculatus Koumans, Temminckia IX, 1953, p. 258.
Caracanthus maculatus Harry, Atoll. Reg. Bull. 18, 1953, p. 160.
Caracanthus maculatus Randall, ibid. 47, 1955, p. 203.

D. VII. 1. 11 (12). A. II. 12. P. 13. V. I. 2.

Height 1.86, 2.27 in length with caudal. Head 2.27, 2.76 in length with caudal. Eye 4.5, equal to snout. Convex interorbital space 1.3 in eye. Preorbital with a flat, triangular spine, directed downwards. Preopercle with 5 knob like spines, the second one from above at the end of the suborbital stay. Opercle with two small spines. Origin of dorsal above gill opening, the first spine shortest. Spinous dorsal separated from soft dorsal by a notch. Spinous dorsal lower than soft dorsal. Anal less deep than dorsal. Pectorals about as long as postorbital part of head. Ventrals minute. Head, body and tail covered with soft papillae, with exception of an area behind pectoral which is naked. Colour yellowish with brown spots on body and tail. Length of specimen described 25 mm. The species may attain a length of 55 mm.

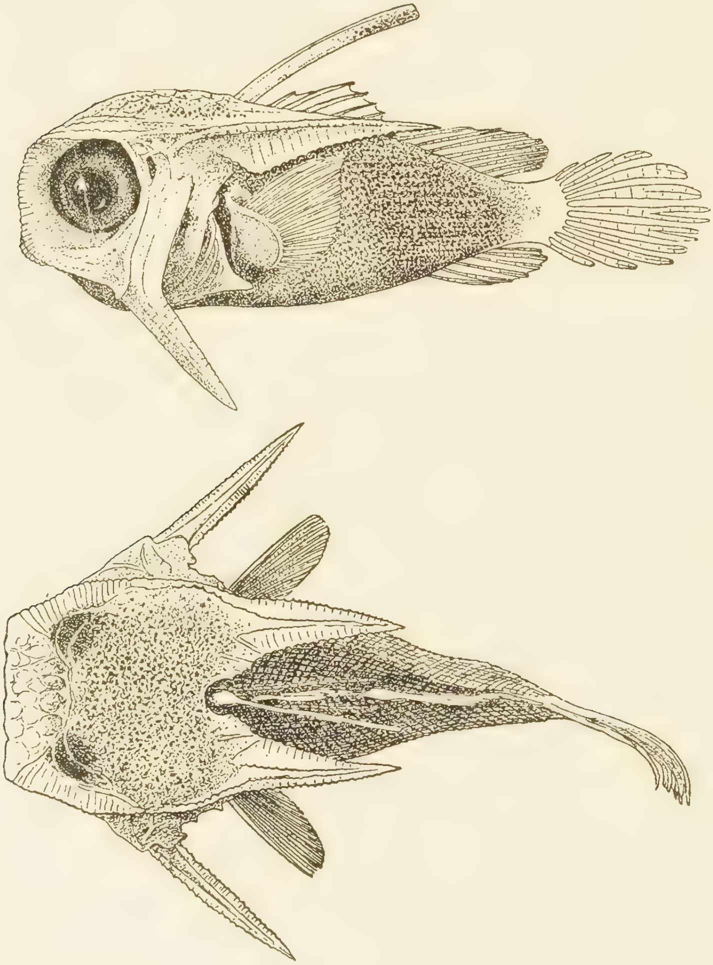

Fig. 41. Larval stage (*Cephalacanthus*) of *Dactyloptena*. Dorsal- and side-view. × 10. After Weber.

Habitat: Talaud Islands! — Maldives, Chagos Archipelago, Engineer Group, Marshall Islands, Gilbert Islands Phoenix Islands, Fiji, Samoa, Society Islands, Tuamotu Islands, Palmyra Island, Washington Island, Christmas Island, Hawaii, Pearl and Hermes Reef.

Note. The specimen described is the only one known from the Indo-Australian Archipelago. As Koumans remarks, it differs from typical specimens by having one spine less in the dorsal.

10. Family DACTYLOPTERIDAE

Compressed, body and tail covered with keeled scales. Head covered by bony plates, those above the shoulder girdle expanded into two huge neck shields, pointed posteriorly. Second orbital movably articulated with the first and with the preopercle, which has a long spine. Mouth inferior. Jaws with granular teeth, none on palate. Two dorsals, the first with IV—V flexible spines, the second with 8 rays. A thorn like spine between them. A detached long ray on occiput and another between lastnamed and first dorsal may be present. Anal short, with 5—6 rays. Pectoral base subhorizontal. Pectorals many-rayed, the anterior 5 or 6 rays short and close together, the rest of the fin very long, reaching to caudal in adults, and enabling the fish to soar above the water. Ventrals with a spine and 4—5 rays. Lateral line absent with exception of one species. Two serrated knife like appendages at base of tail. Vertebrae 22.

Distribution. Mediterranean and warm parts of Atlantic, Indic and Western Pacific.

Note. The larval stage, with short pectorals, has been described as *Cephalacanthus*, and is probably pelagic (Fig. 41). It is known that adults feed on the bottom, using the anterior pectoral rays to scratch for food.

1. **Dactyloptena** Jordan & Richardson

(Jordan & Richardson, Proc. U. S. Nat. Mus. XXXIII, 1908, p. 664 and p. 665)

Corystion (Klein) Bleeker, Nat. Tijdschr. Ned. Indië VII, 1854, p. 494 (nec Rafinesque 1810?).

Daicocus Jordan & Richardson, ibid. p. 664 and p. 667.

Ebisinus Jordan & Richardson, ibid. p. 664.

A long ray on occiput. A shorter one between it and the first dorsal present or absent. Lateral line present in one species. For other characteristics see those of the family.

Distribution: Indian and Western Pacific.

Note. Jordan & Richardson have split the old genus *Dactylopterus* into 4 genera, each with one species viz. *Cephalacanthus volitans* from the Atlantic and the Mediterranean, without elongate ray on the occiput and three genera where this rays is present: *Dactyloptena orientalis, Daicocus peterseni* from Japan and East Africa characterized by the absence of a second free ray between the occipital one and the first dorsal, and *Ebisinus cheirophthalmus,* characterized by the presence of a lateral line. I recognize two genera: *Dactylopterus* and *Dactyloptena,* lastnamed with the species *orientalis, peterseni,* and *cheirophthalmus.*

Key to the Indo-Australian species of Dactyloptena

a. No lateral line . . . . 1. *D. orientalis* p. 174.
b. Lateral line present. A dark blotch on middle
  of pectoral (*Ebisinus*) . . . . 2. *D. macracanthus* p. 176.

1. **Dactyloptena orientalis** (C. V.) (Fig. 42, p. 175)

Dactylopterus orientalis Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 134.

Dactylopterus orientalis Schlegel, Fauna Japonica, Pisces, 1843, p. 37.

Dactylopterus orientalis Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 264.

Dactylopterus japonicus Bleeker, ibid. VI, 1854, p. 396. — Verh. Bat. Gen. XXVI, 1854—1857. Nieuwe nalez. ichth. Japan, p. 72.

Dactylopterus orientalis Günther, Cat. Brit. Mus. II, 1860, p. 222.

Dactylopterus orientalis Jouan, Mém. Soc. Sci. Nat. Cherbourg VIII, 1861, p. 296.

Corystion orientale Bleeker, Ned. Tijdschr. Dierk. I, 1863, p. 236.

Dactylopterus orientalis Day, Fishes of India, Part II, 1876, p. 169.

Dactylopterus orientalis Günther, Fische der Südsee II, 1876, p. 169.

Dactylopterus orientalis Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 227.

Cephalacanthus orientalis Jordan & Snyder, Proc. U. S. Nat. Mus. XXVIII, 1905, p. 126.

Cephalacanthus orientalis Jordan & Evermann, Bull. Fish. Comm. XXIII (1903) 1905, p. 473.

Dactyloptena orientalis Jordan & Richardson, Proc. U. S. Nat. Mus. XXXIII, 1908, p. 666.

Dactylopterus orientalis M. Weber, Siboga Exp. Fische, 1913, p. 517.

Ebisinus cheirophthalmus Fowler & Bean, Proc. U. S. Nat. Mus. LXII, 1922, art. 2, p. 64 (nec Bleeker).

Dactyloptena orientalis Jordan & Jordan, Mem. Carnegie Mus. X, 1922—1925, p. 57.

Dactyloptena orientalis E. K. Jordan, Proc. U. S. Nat. Mus. LXVI, art. 3, 1925, p. 21.

Dactyloptena orientalis Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 947.

Dactyloptena orientalis Whitley, Rec. Austral. Mus. XVII, No. 3, 1929, p. 131.

Dactyloptena orientalis Fowler, Proc. Acad. Nat. Sci. Philadelphia 87. 1936, p. 400. — Hongkong Nat. 6. Suppl. 1938, p. 37. — Monogr. Acad. Nat. Sci. Philadelphia 2, 1938, p. 164, p. 174, p. 235.

Dactyloptena orientalis J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 381.

Dactyloptena orientalis Koumans, Temminckia IX, 1953, p. 260.

Dactyloptena orientalis Munro, The marine and freshwater fishes of Ceylon, 1955, p. 255.

D. 1 + 1 + V + I + 8. A. 5—6. P. 32—35. V. 1. 4—5. Sq. l. 45—47. Ltr. 21—22.

Height 5.1—6.6, 6.3—7.8 in length with caudal, in young specimens 4.4—4.7, 5.7—6.2 in length with caudal. Head 3.3—4, 4—4.9 in length with caudal, in young specimens 3.5—3.7, 4.5—4.7 in length with caudal. Eye 2.9—3.6, about equal to snout and 1.5 in concave interorbital space. In young specimens the eye is 2.2—2.4, longer than snout, and about 1.1 in interorbital space. Maxillary reaching to below anterior half of eye. Preopercular spine as long as head without snout, relatively longer in small specimens. First isolated dorsal ray on occiput with a short posterior membrane, its length about equal to head with preopercular spine. Second isolated ray above base of ventrals, somewhat longer than eye and with a posterior membrane reaching almost to the top of the ray. Origin of first continuous dorsal before or in the line connecting pointed ends of neckshields, the anterior, flexible spines about as long as snout and eye. Between the first and second dorsal there is a short, thorn like spine, seldom wanting. Rays of second dorsal, which is

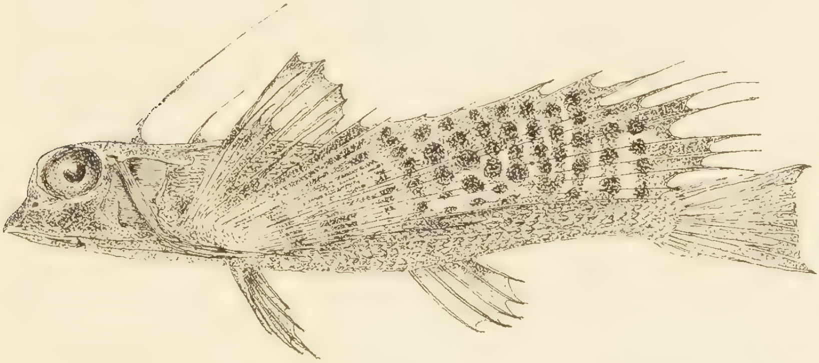

Fig. 42. *Dactyloptena orientalis* (C. V.). × 5/9 nat. size.

about as high as first dorsal, simple but articulated, as are also those of anal. Second anal ray longest, equal to head without snout. Pectorals reaching to tip of caudal, not so far in young specimens. A deep notch between the fifth and sixth and between the sixth and seventh rays. Ventrals long, curved, narrow, as long as distance between hindborder of eye and tip of neckshields, their origin slightly nearer anal than tip of snout. Caudal incised, the rays forked, with exception of the outer ones. Colour of preserved specimens brownish above, lighter below. Membrane of first isolated dorsal ray blackish, of second isolated ray smoke coloured, as that of first dorsal which has a large dark brown patch between the first and second spines. Rays of second dorsal with black rings. Anal hyaline, sometimes with a brown rounded blotch at base of penultimate and last rays. Pectorals smoke coloured, with numerous round, brown blotches, and much smaller white spots. Ventrals dusky. Length 250 mm.

Habitat: Singapore; W. coast of Sumatra; Java Sea!; Celebes (Makassar, Menado); Lembeh Strait; Batjan; Ternate; Buru; Manipa Straits!; Ceram; Ambon!; Banda; Arafura Sea; Waigeu; New Guinea (Manokwari, Humboldt Bay!). — East coast of Africa, Madagascar, Somalia, Mauritius, Réunion, Muscat, Aden, Cargados Carajas, coast of India, Ceylon, Riu Kiu Islands, Japan, China, Korea, Formosa Malay Peninsula, Philippines, coasts of Queensland and of New South Wales, New Hebrides, New Caledonia, eastwards to Hawaii and Tuamotu Islands.

2. **Dactyloptena macracanthus** (Blkr)

Dactylopterus macracanthus Bleeker, Nat. Tijdschr. Ned. Indië VII, 1854, p. 449.
Dactylopterus cheirophthalmus Bleeker, ibid. p. 494.
Dactylopterus macracanthus Günther, Cat. Brit. Mus. II, 1860, p. 223.
Dactylopterus chirophthalmus Günther, l.c.
Corystion chirophthalmus Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 291.
Dactylopterus macracanthus Alcock, Journ. Asiat. Soc. Bengal LXV, 1896, p. 320.
Dactylopterus chirophthalmus Alcock, l.c.
Cephalacanthus macracanthus Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 40.
Ebisimus cheirophthalmus Jordan & Richardson Proc. U. S. Nat. Mus. XXXIII, 1908, p. 665.
Ebisimus cheirophthalmus Koumans, Temminckia IX, 1953, p. 260.

D. 1 + 1 + V—VI + 1 + 8. A. 6. P. 32—36. V. 1. 4. Sq. l. 45. Ltr. 21.

Height about 5.3, head about 3.5 in length. Snout 2.75, eye about 2.7—3. Preopercular spine as long as head without snout. First isolated dorsal ray on occiput with a well developed posterior membrane, less than head with preopercular spine. Second isolated dorsal ray less than eye. First dorsal of about the same height as soft dorsal; a short, keel like spine in the space between the two fins. Origin of anal slightly nearer to base of caudal than to gill opening. Tips of pectorals reaching to the base of the caudal in young and to the tip of the caudal in adults. Pectorals with a large, round, black blotch. Length 165 mm (Compiled).

Habitat: Singapore; Celebes (Makassar Menado!). Ambon, Banda. — Off Madras, off Malabar and Orissa coasts, Philippines.

Note. The type specimens of *D. macracanthus* and *cheirophthalmus* apparently are lost. Günther (Proc. Zool. Soc. London 1871, p. 663) supposed that *D. cheirophthalmus* is the young of *orientalis*. Jordan & Richardson (l.c.) described specimens from the Philippines as having a lateral line. Bleeker and all authors after him did not mention the presence of a lateral line and hence it is not certain that Jordan and Richardson's species is the same as that of Bleeker. Among the specimens recorded by Koumans (l.c.) from Menado and which I examined in the Leiden Museum, a specimen of 42 mm shows a distinct lateral line.

Species of doubtful occurrence

Cottus tentaculatus Kner

Cottus tentaculatus Kner, Sitzber. Akad. Wien LVIII, 1868, p. 314.

Porocottus tentaculatus Jordan & Starks, Proc. U. S. Nat. Mus. XXVII, 1903, p. 286.

Kner described this species from a single specimen said to be from Singapore. As Jordan & Starks, l.c., remark, this is of course an error and it is probable that the fish came from the Pacific coast of North Asia.

Order HYPOSTOMIDES

No air bladder. Entirely enclosed in an osseous cuirass, which on the head is formed by the bones of the head, on the body by three paired dorsal scutes and by paired lateral and ventral scutes. Besides there are some median scutes in the ventral series. The scutes of the body are anchylosed and form an unmovable envelop. On the tail there are dorsal and ventral scutes which meet on the lateral sides, and which form a series of movable tail rings. A series of small lateral scutes, intercalated between the dorsal and ventral scutes, are present on all or on some of the anterior tail rings. Last tail ring with two lateral scutes on each side which may be anchylosed. Opisthotic, alisphenoid, orbitosphenoid and basisphenoid absent. No eye-muscle canal. The posttemporal forms part of the skull. Parietals separated by supraoccipital. Nasals coalesced and produced into a toothed rostrum before the mouth. Rostrum shorter in females than in males. The mouth is contractile and can be retracted into a subrostral chamber; it is small and is bordered above by the premaxillaries only; the maxillaries are bent forwards in their anterior part, projecting beyond the mouth, and visible as two parallel bony rods in the anterior part of the subrostral chamber when the mouth is closed. A supplementary bone connecting premaxilla and maxilla. Pterygo-palatine bar very shortened, consisting of palatines and one pair of pterygoids (ento- and metapterygoid wanting), completely separated from the hyomandibular suspensorium, and connected with anterior end of vomer, lodged in the subrostral chamber. Mandibular suspensorium consisting of hyomandibular, symplectic, and quadrate. Preopercle large, almost ventral, the head being depressed. Opercle and subopercle very small, hidden in thick skin. Interopercle slender, widely separated from subopercle, only its anterior end visible from without. Five well developed branchiostegals. Lower and upper pharyngeals with conical teeth. Hypobranchial I—III present; epibranchial IV very long and stout, widely separated from the ceratobranchial. Pharyngobranchials I and IV absent. Branchial opening reduced to a narrow lateral opening. A part of the cleithrum enters the dermal skeleton of the trunk. Scapular arch and pectorals almost horizontal, their inner faces looking upwards. Foramen scapulare bounded by both scapula and coracoid. Articular face for pectoral rays fixed across a slit in the carapace, and made up of part of the scapula and three stout basals. All rays of median and paired fins unbranched, but generally articulated: the pectoral rays may be spiny, they are long and give to those fins a fan-like appearance. Ventrals consisting of a small spine and 2 or 3 rays. Dorsal and anal short, opposite to each other on 2nd to 4th tail rings. Caudal with 8 rays. Lateral line present running through upper lateral scutes of the trunk and through lateral and ventral scutes of the tail. Vertebrae amphicoel, 7 + 12—15, the anterior six unmovably joined. Last abdominal and first caudal vertebrae with strong ribs. Four gills, each with a double row of leaves. Pseudobranchiae present.

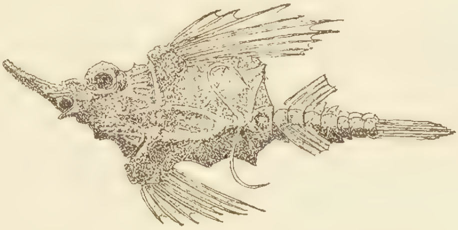

Fig. 43. *Pegasus draconis* L. nat. size.

1. Family PEGASIDAE

For characters of the only family see those of the order.

1. **Pegasus** L.

Eurypegasus Bleeker, Ned. Tijdschr. Dierk. I, 1863, p. 250.
Parapegasus (Bleeker) Duméril, Hist. Nat. Poissons II, 1870, p. 492.
Leptopegasus Bleeker, Ned. Tijdschr. Dierk. IV, 1873, p. 125.
Zalises Jordan & Snyder, Proc. U. S. Nat. Mus. XXIV, 1901, p. 2.
Spinipegasus Rendahl, Arkiv f. Zoologi 21A, No. 27, 1930, p. 56 (as a subgenus).

For characters of the only genus see those of the order.

Key to the Indo-Australian species of Pegasus

1. Twelve tail rings. Pectoral rays not spiny. No pits on occiput (*Pegasus* s. str.) . . . . 1. *P. volitans* p. 180.
2. Eleven tail rings. Pectoral rays spiny, the fifth much stronger than the others. No pits on occiput (*Spinipegasus*) . . . . 2. *P. laternarius* p. 181.
3. Eight tail rings Pectoral rays spiny, the fifth not stronger than the others. Two deep pits on occiput (*Zalises*) . . . . 3. *P. draconis* p. 182.

1. **Pegasus volitans** L.

Pegasus volitans Linné, Syst. Nat. Ed. 10., 1758, p. 338.
Pegasus volans Linné, ibid. Ed. 12, 1766, p. 418.
Pegasus natans Linné, l.c.
Pegasus natans Bloch, Ausländ. Fische I, 1785, p. 53.
Pegasus natans Lacepède, Hist. Nat. Poissons II, 1800, p. 72, p. 85 [1]).
Pegasus pristis Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 606.
Pegasus natans Bleeker, Verh. Bat. Gen. XXV, 1853. Bijdr. kennis Trosk. Visschen, p. 28.
Pegasus natans Kaup, Cat. Lophobr. Fish. 1856, p. 4.
Pegasus volitans Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 274.
Pegasus natans Günther, Cat. Brit. Mus. VIII, 1870, p. 148.
Parapegasus natans Duméril, Hist. Nat. Poissons II, 1870, p. 493.
Leptopegasus natans Bleeker, Ned. Tijdschr. Dierk. IV, (1871) 1872, p. 125.
Parapegasus natans Bleeker, Arch. Neerl. Sc. Nat. XIII, 1878, p. 49.
Pegasus natans Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 222.
Parapegasus natans Fowler, Journ. Acad. Sc. Philadelphia (2) XII, Part 4, 1904, p. 501.
Parapegasus natans Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 10.
Parapegasus natans McCulloch, Biol. Res. Endeavour III, 1915, p. 110. — Checklist Fish. New S. Wales, Part II, 1919, p. 29.
Parapegasus natans Fowler & Dean, Proc. U. S. Nat. Mus. LXII, Art. 2, 1922, p. 10.
Parapegasus natans Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 116. — Hongkong Nat. VI, 1935, p. 134.
Pegasus volitans Rendahl, Arkiv f. Zoologi 21A, No. 27, 1930, p. 9.
Pegasus natans J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 173.
Parapegasus natans Munro, The marine and fresh water fishes of Ceylon, 1955, p. 290.

D. 5. A. 5. P. 10—11. V. I. 2.

Much flattened, the greatest depth about 14 in the length without caudal. Head 3—3.3 in length without caudal. Snout 1.8—1.9 in head, slender, much flattened, rounded in front, sides with a row of antrorse spines which are less conspicuous in larger specimens. Greatest breadth at base of pectorals 5.6—6.9 in length without caudal. Tail consisting of 12 rings, the posterior rings fused. The anterior tail rings quadrangular in cross section, the posterior ones much depressed. Two ridges on back, parallel to each other, starting from a supraorbital ridge and continued to end of tail, but almost flattened out on 5 posterior rings. A lateral ridge on each side, beginning above pectoral and disappearing on sides of tail. In young specimens the dorsal and lateral ridges have a spine at the end of each ring, the spines being directed backwards, but they get more obtuse and almost disappear in older specimens, excepting those of the lateral ridge in the posterior part of the tail, where there are two spines on each ring, one directed forward at the beginning, and one directed backward at the end of the ring. Anus slightly nearer tip of snout than base of caudal. Dorsal and anal opposite to each other, on second to fourth tail ring. First dorsal and anal rays longest, the following gradually decreasing in length. Caudal obliquely truncate. All pectoral rays flexible and articulated, the fifth to seventh longest, somewhat longer than snout. Ventral spine close to the first ray, which is long, curved, and articulated in its distal part. The second ray minute. Colour of preserved specimens brownish or greenish, some of the rings sometimes darker. Body and tail sometimes spotted with black. Pectorals and often also dorsal with black dots. Length over 100 mm.

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[1]) Günther l.c. cites *Pegasus spatula* Lacepède, but this is incorrect. Lacepède speaks of "pégase spatule", but gives as scientific name: "*Pegasus natans* Linné, édition de Gmelin".

Habitat: Singapore; Sumatra (Padang, Priaman, Siboga); Nias; Java (Jakarta!, Semarang!; Madura!; Lombok!; Celebes (Makassar!, Tello!); Ambon; Kafal near Misol; New Guinea! — Delagoa Bay, Muscat, Baluchistan coast, Ceylon, coasts of China, Japan, Formosa, Philippines, Torres Straits, Queensland, New S. Wales and Western Australia. In sea.

2. **Pegasus laternarius** Cuv.

Pegasus laternarius Cuvier, Règne Animal II, 1817, p. 332.
Pegasus laternarius Kaup, Cat. Lophobr. Fish. 1856, p. 3.
Pegasus volans Günther, Cat. Brit. Mus. VIII, 1870, p. 148 (nec L.).
Pegasus laternarius Duméril, Hist. Nat. Poissons II, 1870, p. 491.
Pegasus volans Bleeker, Ned. Tijdschr. Dierk. IV (1871) 1872, p. 125 (nec L.).
Pegasus volans Johnstone, Pearl Oyster Rep. II, Fishes, 1904, p. 214 (nec L.).
Pegasus laternarius Rendahl, Arkiv f. Zoologi 21A, No. 27, 1930, p. 27.
Parapegasus volans Fowler, Hongkong Naturalist VI, 1935, p. 134 (nec L.).
Parapegasus volans Munro, The marine and fresh water fishes of Ceylon, 1955, p. 290 (nec L.).

D. 5. A. 5. P. 10. V. I. 2.

Somewhat compressed, body not much deeper than anterior part of tail, which is much depressed in its posterior part. Rostrum rather short, with coarse teeth along its lateral edges, along the two upper, and along the two lower ridges. Two parallel ridges on back, continued on tail, and consisting of a series of compressed tubercles, the points of which are directed backwards. A lateral ridge on each side of body, without prominent tubercles. A small tubercle on the lateral scutes of the tail, which are present on the 2nd, 3rd, and 4th tail rings. Pectoral rays spiny, the fifth much stronger than the others. Dorsal and anal opposite to each other, on 2nd to 4th tail ring. Length 90 mm.

Habitat: Java?. — China!, Ceylon.

Note. This species has been recorded from Java by Duméril: "individus assez nombr. de Java; Leschenault". As is well known Leschenault's localities are often erroneous. As this species has never been recorded from Java since, it is strange that Leschenault should have been able to collect there rather numerous specimens. It is more probable that his specimens came from China, where *laternarius* seems to be not very rare. In the Leiden Museum is a dried specimen labelled: "Oost-Indië", apparently from an old collection. As *laternarius* is not confined to China but has been recorded by Johnstone l.c. without doubt from Ceylon, its occurrence in the Indo-Australian Archipelago is not impossible.

3. **Pegasus draconis** L. (Fig. 43, p. 179)

Pegasus draconis Linné, Syst. Nat. Ed. 12. 1766, p. 418.
Pegasus draconis Bloch, Ausländ. Fische I, 1785, p. 52.
Pegasus draconis Lacepède, Hist. Nat. Poissons II, 1800, p. 77, p. 78.
Pegasus volans Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 307 (nec L.).
Pegasus draconis Bleeker, Verh. Bat. Gen. XXV, 1853, Bijdr. Trosk. Visschen, p. 27.
Pegasus draco Kaup, Cat. Lophobr. Fish. 1856, p. 5.
Eurypegasus draconis Bleeker, Ned. Tijdschr. Dierk. I, 1863, p. 250.
Pegasus draco Günther, Fishes of Zanzibar, 1866, p. 138.
Pegasus draconis Günther, Cat. Brit. Mus. VIII, 1870, p. 147.
Pegasus draco Duméril, Hist. Nat. Poissons II, 1870, p. 490.
Pegasus draconis Day, Fishes of India, Part II, 1876, p. 280.
Pegasus pauciradiatus Ogilby, Cat. Fish. New S. Wales in Rep. Comm. Fish. New S. Wales (1886) 1887. Append. a. p. 34.
Zalises umitengu Jordan & Snyder, Proc. U. S. Nat. Mus. XXIV, 1901, p. 2.
Pegasus papilio Gilbert, Bull. U. S. Fish. Comm. XXIII, Part II (1903) 1905, p. 614.
Zalises draconis Franz, Abh. K. Bayer. Akad. Wiss. IV. Suppl. Bd. I. Abh. 1910, p. 21.
Pegasus draconis Günther, Fische der Südsee III, 1910, p. 428.
Pegasus umitengu, Jordan, Tanaka & Snyder, Journ. Coll. Sc. Univ. Tokyo XXXIII, Art. 1. 1913, p. 92.
Pegasus draconis M. Weber, Siboga Exp. Fische, 1913, p. 121.
Pegasus volitans Ogilby, Mem. Queensl. Mus. V, 1916, p. 181 (nec L.).
Pegasus volitans Whitley, Rec. Austr. Mus. XV, 1927, p. 295. (nec L.).
Pegasus draconis Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 1023.
Pegasus draconis Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 116.
Pegasus papilio Fowler, l.c.

Pegasus volitans McCulloch, Checklist Fish. Austr. Part I, 1929, p. 98 (nec L.).
Pegasus draconis Rendahl, Arkiv f. Zoologi 21A, No. 27, 1930, p. 21.
Pegasus draconis Fowler, Ann. Natal Mus. VII, Part III, 1934, p. 412. — Hongkong Naturalist VI, 1935, p. 133.
Pegasus draconis J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 173.
Pegasus draconis Munro, The marine and fresh water fishes of Ceylon, 1955, p. 290.

D. 5. A. 5. P. 10—11. V. I. 2.

Head and tail less deep than body, the posterior part of the trunk elevated, the fish hence hump backed in side view, its greatest height 4.6—5 in length without caudal. Head 2.5—2.7 in length without caudal. Snout 2.25-2.95 in head, slightly spatulate, with a toothed ridge along sides, and two parallel toothed ridges along its upper side. The lower side of the rostrum has a median groove bordered by two rough, but not really toothed low longtudinal ridges, parallel anteriorly, diverging to surround the mouth posteriorly. Greatest breadth at base of pectoral 2.2—2.6 in length without caudal. Two deep pits behind occiput. Two longitudinal ridges on the back, forming blunt tubercles on each dorsal plate. A similar ridge on each side of the trunk, with similar but less developed tubercles. The dorsal ridges are continued on the tail, but as the tail is much less broad than the body they form here the upper edges of the tail, which is quadrangular in cross section. Similar ridges on the lower edges of the tail. The upper and lower tail ridges notched between the rings. A lateral ridge present on each side of the tail in the form of a row of compressed tubercles, one on each of the lateral caudal scutes, present on the first, second, fourth and fifth tail rings. Pectoral rays stiff and spine-like, the fifth not stronger than the others, equal in length to the length of the tail. Caudal truncate, as long as rostrum. Colour of preserved specimens brown, the rostrum and the last caudal ring often darker. Pectorals hyaline with a terminal and a subterminal milky longitudinal band; pectoral spines with brown spots, forming rows. Sometimes the row behind the milky band consists of much larger spots, in other cases these spots are indistinct. Length 100 mm.

Habitat: Sulu Islands; Sapeh Strait; Flores!; Banda!; Ambon!; Ceram!; Batjan!; Ternate. — Natal coast, Madagascar, Zanzibar, Red Sea, Mauritius, Réunion, Maldives, coasts of India, Ceylon, Andamans, China, Japan, Philippines, coasts of Queensland, Solomon Islands, New Britain, Hawaii.

Order PEDICULATI

Airbladder, if present, without open duct. Parietals, if present, separated by the supraoccipital. No bony stay for the preopercle. Opercular bones generally small and slender. Mouth bordered above mainly by the premaxillaries, which are often protractile. Lower pharyngeals separate. Ribs absent. Pectoral radials elongate, the lowest considerably expanded distally and generally forming a kind of arm; the rays generally forming an angle with the brachial part of the fin. Ventrals, if present, jugular. Dorsal consisting of a spinous and a soft part; the spinous part either of 2—4 pungent spines with fixed basalia, or of 1—6 flexible spines, the anterior ones on the head, the first one (illicium) generally terminating in a flap or a bulb to lure fishes on which they prey. No visible scales, but skin either naked or covered by spines or prickles.

Key to the Indo-Australian families of Pediculati

A. Spinous dorsal post-cephalic, of 2 to 4 pungent spines. Gill opening in front of base of pectorals (Suborder *Batrachoidea*) . . . . . . 1. *Batrachoididae* p. 185.

B. Spinous dorsal of 1—6 flexible spines, seldom absent, when complete the first 3 on the head, the first an illicium. Gill opening above, behind, or below, rarely in front of base of pectorals (Suborder *Lophioidea*).

  a. Ventrals present.

    a^1. Head large, depressed, mouth horizontal, very large and with very strong teeth. Spinous dorsal typically of 3 cephalic and 3 post-cephalic rays . . . . . . 2. *Lophiidae* p. 191.

    b^1. Head and body compressed. Mouth vertical. Spinous dorsal typically of 3 cephalic rays . . . . 3. *Antennariidae* p. 196.

    c^1. Head as broad as deep. Mouth vertical. Spinous dorsal represented only by the illicium which is short and retractile into a cavity . . . . 4. *Chaunacidae* p. 222.

    d^1. Head large, depressed. Mouth small or moderate, horizontal, terminal or subterminal, protractile downwards. Spinous dorsal represented by the illicium, which has a very short stalk and broad trans-

verse expansion, contained in a roofed cavity on anterior surface of snout . . 5. *Onchocephalidae* p. 224.
b. Ventrals absent (Suborder *Ceratiiformes*) 1)
  a^1. Branchiostegals 6 $(4 + 2)$. Hyomandibular with double head. Preopercle straight or slightly curved.
    a^2. Pelvic bones much expanded posteriorly.
      a^3. D^2. 12—17. A. 4. Four pectoral radials . . . . 6. *Melanocetidae* p. 241.
      b^3. D^2. 6. A. 4. Three pectorals . . 7. *Diceratiidae* p. 245.
    b^2. Pelvic bones more or less expanded posteriorly. D^2. 4—8. A. 4—8. Three pectoral radials . . . . 8. *Oneirodidae* p. 245.
    c^2. Pelvic bones slender, not expanded. D^2. 3—5. A. 3—5, near caudal. Four pectoral rays . . . . 9. *Ceratiidae* p. 256.
  b^1. Branchiostegals 5 $(4 + 1)$. Hyomandibular with single head. No pelvic bones. D^2. 2—4. A. 2—4. Three pectoral radials. Preopercle strongle curved or angular . . . . 10. *Linophrynidae* p. 259.

1. Family BATRACHOIDIDAE

Body more or less elongate, head depressed. Mouth wide, with conical or cardiform teeth in jaws and on palate. Two dorsals, the first post-cephalic, of 2—4 pungent spines, the second of soft rays. Soft dorsal and anal more or less elongate. Gill opening in front of base of pectoral.

Distribution: Several genera along the coasts of nearly all the tropical and temperate regions. One genus in our region.

1. **Halophryne** Gill

(Gill, Proc. Acad. Nat. Sci. Philadelphia XV, 1863, p. 170)

Batrachus auctorum (nec Bl. Schn.).
Bathrachomoeus Ogilby, Ann. Queensl. Mus. IX, Part II, 1908, p. 46.
Coryzichthys Ogilby, ibid. p. 46, p. 50.

Head depressed. Eyes superior. Body and tail compressed or more or less cylindrical. No scales. Head with tentacles. Longitudinal rows of small, paired tentacles along back and along belly, less developed along middle of sides. Mouth rather large. Conical or

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1) Key after Regan & Trewavas.

villiform teeth in jaws, on vomer, and on palatines. Two dorsals, the first with III spines, covered by thick skin, the second with 18—23 rays. Anal with 15—19 rays, the two anterior ones much smaller than the others and often separated from each other and from the rest of the fin by low membranes. Pectorals rounded. Ventrals with a spine and 2 rays, the first of which close to the spine and enveloped by rather thick skin, forming a kind of pad in the basal half of the front margin of the fin; second ray branched. Caudal rounded. Gill opening a vertical slit before base of pectorals.

Distribution: As taken here this genus consists of a few species from the Indic and from Australian waters.

Key to the Indo-Australian species of Halophryne

A. A pore in pectoral axil. Two spines on opercle, one on subopercle. D^2. 22—23. Gill opening longer than base of pectoral (*Batrachomoecus*) . 1. *H. trispinosus* p. 186.

B. No axillary pore. Two spines on opercle, two on subopercle. D^2. 18—20. Gill opening shorter than base of pectoral (*Halophryne* s. str.).

- a. Strong conical teeth in a single row in jaws, vomer and palatines, but a second row of smaller teeth on vomer and about 3 rows at symphysis of both jaws. Maxillary reaching beyond or below hindborder of eye . . . 2. *H. gangene* p. 188.
- b. Jaws, vomer and palatines with villiform bands of small conical teeth. Maxillary reaching to below hindborder of pupil . . 3. *H. diemensis* p. 189.

1. **Halophryne trispinosus** (Gthr.)

Batrachus grunniens Cuvier & Valenciennes, Hist. Nat. Poissons XII, 1837, p. 466 (nec L.).
Batrachus grunniens Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850, p. 1187.
Batrachus trispinosus Günther, Cat. Brit. Mus. III, 1861, p. 169.
Batrachus grunniens Day, Fishes of India, Part II, 1876, p. 269 (nec L.).
?*Bratrachus dubius* Macleay, Proc. Linn. Soc. New S. Wales VIII, 1883, p. 267 (nec Shaw, fide McCulloch).
Batrachomoeus trispinosus Bean & Weed, Proc. U. S. Nat. Mus. XLII, 1912, p. 609.
Batrachus trispinosus Max Weber, Siboga Exp. Fische, 1913, p. 557.
Batrachus grunniens Blegvad, Danish Inv. Iran, part III, 1944, p. 221 (nec L.).
Batrachomoeus trispinosus J. L. B. Smith, Ann. Mag. Nat. Hist. (12) V, 1952, p. 322.
Batrachus grunniens Mumo, The marine and fresh water fishes of Ceylon, 1955, p. 285 (nec L.).

D^1. III. D^2. 22—23. A. 16—19. P. 22—24. V. I. 2.

Height 4.1—5.3, 4.9—6.4 in length with caudal. Head 2.5—2.8, 2.9—3.4 in length with caudal. Eye 4.8—6.7, equal to or more than snout, and equal to flat interorbital space in young, and 1.4—3.6 in large specimens. Mouth scarcely oblique. Maxillary reaching to below hindborder of eye, not so far in young specimens. A single row of conical teeth in the jaws, in two rows at symphysis. A series of stronger, conical teeth on the vomer and palatines, on the vomer an irregular second series of similar teeth. Head with simple or arborescent tentacles, some of them of rather large size on snout, above upper jaw, along chin, on sensory canals below eye, and on preopercle, subopercle, and opercle. A scalloped flap or tentacle above hinderpart of eye, another much smaller one above middle of eye. About 30 small tentacles in a row along back from above opercle to base of caudal, and in a row along belly, from base of pectoral to base of caudal. A few distant, similar tentacles in a row on sides of body and tail. A distinct pore in axilla of pectorals. Opercle with two spines. Subopercle with a single spine. Second dorsal spine longest, about equal to eye. Longest dorsal rays about equal to snout and eye, the last rays sometimes simple or rudimentary and attached by membrane to caudal peduncle. Anal less deep than second dorsal, the two anterior rays small, the last ray attached by membrane to the caudal peduncle. Pectorals rounded, less than postorbital part of head, ventrals scarcely shorter. Caudal rounded. Gill opening vertical, longer than base of pectoral. Colour of preserved specimens light brown. Body and tail with broad, darker transverse bands, margined by still darker, sometimes connected by a broad longitudinal band. Lower side of head and belly light. Second dorsal with more or less distinct alternating, oblique,

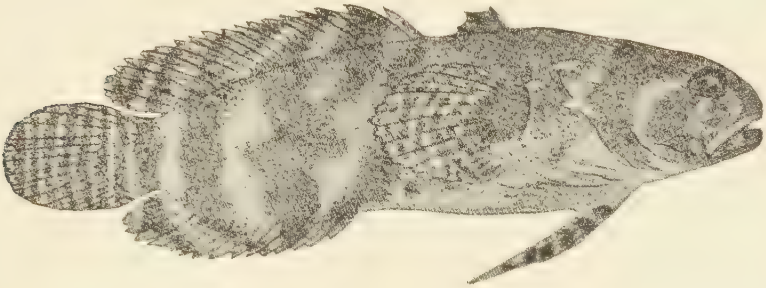

Fig. 44. *Halophryne diemensis* (Lesueur). nat. siz.

light and dark bands. The transverse bands of tail more or less continued on base of second dorsal and anal; lastnamed has some dark markings along the tips of the rays. Caudal and pectorals light with dark, transverse bands. Ventrals with less distinct bands. Length 285 mm. (Specimens of *Batrachus grunniens* C.V. in the Paris museum examined).

Habitat: Singapore; Java (Jakarta); Celebes (Makassar!); New Guinea (Digul!). — Madagascar?. Persian Bulf, Coasts of India, Ceylon, Malayan Peninsula. In sea and brackish water.

Note. According to McCulloch (Austr. Zool II, part III, 1923, p. 122) *Batrachus trispinosus* mentioned by Kner (Novara Exp. Fische, p. 189) from Sidney is apparently referable to *B. dubius*. The fin-counts (D^1. III, D^2. 20, A. 16) are in favour of this supposition; moreover, *trispinosus* has never been found in Sidney.

2. **Halophryne gangene** (H. B.)

Cottus grunniens Bloch, Ausländ. Fische II, 1786, p. 157. Tafel 179 (nec L.).
Cottus grunniens Bloch Schneider, Syst. Ichth. 1801, p. 43 (nec L.).
Batrachoides gangene Hamilton Buchanan, Fishes of the Ganges, 1822, p. 34.
Batrachus grunniens Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 487 (nec L.).
Batrachus grunniens Günther, Cat. Brit. Mus. III, 1861, p. 168. — Ann. Mag. Nat. Hist. (4) IX, 1872, p. 439 (nec L.).
Batrachus grunniens an *reticulatus*? Steindachner, Sitzber. Akad. Wien LX, 2. Abth. 1869, p. 564.
Batrachus Gangene Day, Fishes of India, Part II, 1876, p. 270.
Batrachus grunniens Steindachner, Sitzber. Akad. Wien, XXXII, 1. Abth. 1880, p. 246 (nec L.).
Batrachus gangene Vinciguerra, Ann. Mus. Civ. Genoa (2) IX, 1890, p. 173.

D^1. III. D^2. 19—20. A. 16—18. P. 20—21. V. I. 2.

Height 3.2—3.9, 3.8—4.8 in length with caudal. Head 2.4—2.5, 2.9—3 in length with caudal. Eye 5.9—8.3, 1.2—1.9 in snout and 1.4—2.4 in the almost flat interorbital space, which is comparatively wider in adults than in young and goes 3.6—4.6 in head. Mouth scarcely oblique. Maxillary reaching beyond hindborder of eye in large specimens, to below hindborder of eye in smaller ones. Pointed, conical teeth in about 3 rows near symphysis of jaws, in one row laterally, those of lower jaw larger than those of upper jaw. Still larger teeth in a single row on palatines, continuous with those on vomer which has a row of smaller teeth in front. Single and arborescent tentacles on snout, on superior orbital rim, along sensory canals, on preopercle, subopercle and opercle, and along lower jaw, more developed in adults than in young; 24—27 similar tentacles in a row along the lateral line on the back, and 21 in a line along belly from base of pectorals to base of caudal; between these rows a row of distant tentacles, not always distinct. Two short spines on opercle and two on subopercle. No axillary pore. First dorsal spine as long as eye, second one somewhat longer, third shortest, all spines covered by thick skin. Longest ray of second dorsal about equal to snout and eye, last ray connected by membrane to caudal peduncle near base of caudal. Anal somewhat less deep than second dorsal, the first and second rays very small. Pectorals rounded, less than postorbital part of head, ventrals slightly shorter. Caudal rounded. Gill openings shorter than base of pectorals. Colour of preserved specimens lighter or darker brown. Back and sides of body and tail with irregular, large, dark blotches and marmorations. Second dorsal with alternating, oblique, light and dark bands, less distinct in adults. Anal with similar, but less regular bands. Rays of pectorals and caudal transversely striped dark and light, but as the stripes of adjoining rays are not always on the same level, the effect of the fin as a whole is more or less that of a chessboard. Ventrals light with dark markings. Length over 200 mm.

Habitat: Singapore; Pulu Brani; Sumatra (Benkulen, Palembang); Bintang; Riouw, Biliton; Banka; Java (Jakarta); Madura!; Bawean; Borneo (Sampit, Banjermassin); Celebes (Makassar!, Menado); Adonare!; Ambon. — Madagascar, Muscat, Persian Gulf, coasts of India, Siam, Indochina, Straits of Malacca!, Pinang, Philippines. In sea and brackish water.

Note. This fish is known to make croaking noises.

3. **Halophryne diemensis** (Lesueur) (Fig. 44, p. 187)

Batrachoides diemensis Lesueur, Journ. Acad. Nat. Sci. Philadelphia III, 1823, p. 402.
Batrachus quadrispinis Cuvier & Valenciennes. Hist. Nat. Poissons XII, 1837, p. 487.
Batrachus diemensis Richardson, Ann. Nat. Hist. XI, 1843, p. 352. — Voyage Erebus & Terror, Fishes, 1846, p. 17.
Batrachus diemensis Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 168.
Batrachus diemensis Günther, Cat. Brit. Mus. III, 1861, p. 170.
Batrachus diemensis Steindachner, Sitzber. Akad. Wien LVI, 1. Abth. 1867, p. 312.
Batrachus Mülleri Klunzinger, ibid. LXXX, 1. Abth. 1879, p. 387.
Batrachus diemensis Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 208.
Batrachus grunniens Macleay, Proc. Linn. Soc. New S. Wales VII, 1882, p. 360 (nec Bl., fide Whitley).
Porichthys Queenslandiae De Vis, ibid. p. 370.

?*Marcgravia diemensis* Jordan & Richardson, Bull. Bur. Fish. XXVII (1907) 1908, p. 282.

Coryzichthys guttulatus Ogilby, Proc. Roy. Soc. Queensland XXIII, 1910, p. 42.

Coryzichthys diemensis Whitley, Rec. Austr. Mus. XVI, 1927, p. 30.

Coryzichthys diemensis Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 447.

Coryzichthys diemensis McCulloch, Mem. Austr. Mus. V, 1929, p. 359.

Halophryne diemensis Whitley, Mem. Queensland Mus. XI, 1937, p. 144.

D^1. III. D^2. 18—20. A. 15—18. P. 20—23. V. I. 2.

Height 3.2—4.2, 4—5.2 in length with caudal. Head 2.5—2.9, 2.9—3.6 in length with caudal. Eye 3.6—4.8, a little more than snout and equal to or more than slightly concave interorbital space, which goes 4.4—6.7 in head. Mouth scarcely oblique. Maxillary reaching to below hindborder of pupil. Jaws, vomer and palatines with villiform bands of small, conical teeth, those of palatines tapering into a single series of teeth backwards. Simple and arborescent tentacles on snout, on superior orbital rim, which is slightly elevated, along sensory canals, on preopercle, opercle, and subopercle, and along lower jaw. About 31 tentacles in a row along back and about 31 in a line along belly, from before origin of ventrals to base of caudal. Between these rows a row of few distant tentacles along sides of body and tail. No axillary pore. Two spines on opercle and two on subopercle, the superior opercular spine rather stout, the inferior subopercular one small. Second dorsal spine longest, about equal to eye; third shortest. Longest rays of second dorsal about equal to snout and eye, last ray connected by membrane to caudal peduncle, the first and second rays small. Pectorals rounded, equal to or slightly more than postorbital part of head. Ventrals slightly shorter. Caudal rounded. Gill opening shorter than base of pectoral. Colour of preserved specimens lighter or darker brown, young specimens with two or three broad, dark, transverse bands between second dorsal and anal and another one at base of caudal peduncle. In larger specimens these bands often fade, the margins remaining darker. Second dorsal with alternating dark and light oblique bands, dissolved into irregular blotches or almost disappearing in larger specimens; the same is the case with the similar bands on the anal. Pectorals and caudal with transverse, dark bands or rows of dark spots. Ventrals with more or less distinct dark markings. Belly uniform or with numerous dark spots. Length 165 mm.

Habitat: Singapore; Banka; Borneo (Sandakan); Ceram; Ambon; Rotti!; Samau!; Timor; Aru Islands!; Waigeu!; New Guinea (Digul! Port Moresby). — China, Philippines, Thursday Island!, Australia. In sea and brackish water.

2. Family LOPHIIDAE

Head very large and depressed. Mouth large and more or less horizontal. Strong depressible teeth in several rows in front part of the jaws, sides of jaws with a row of fixed teeth. Generally a few large, fixed teeth on vomer and a single row of teeth on palatines. Gill opening below and behind, or partly in front of base of pectoral. Two dorsals, the first typically consisting of six flexible or even thread like spines, the first and second close together on snout are always present; the third, behind eyes, may be absent, the fourth to sixth spines form a continuous fin, but often are reduced in number or concealed below the skin. Soft dorsal with 7—12 rays, anal with 5—11 rays.

Distribution: Shore or deep sea fishes of the Atlantic Indic, Pacific and adjoining seas.

Key to the Indo-Australian genera of Lophiidae

a. Head much depressed. Spinous dorsal with 4—6 spines, the third (occipital) spine present. Gill openings partly below, partly in front of and above the pectorals . . . . 1. *Chirolophius* p. 191.
b. Head moderately depressed. Spinous dorsal with 3—4 spines, the third spine absent . . . . 2. *Sladenia* p. 196.

1. **Chirolophius** Tate Regan

(Tate Regan, Ann. Mag. Nat. Hist. (7) XI, 1903, p. 279)

Head much depressed. Gill openings partly below, partly in front and above the pectorals. Opercular membrane with a free posterior margin. First dorsal with IV—VI spines, second dorsal with 7—9 rays. Anal with 5—6 rays. Pectorals with 13—18 rays. Vertebrae about 19.

Distribution: Indo-Pacific.

Key to the Indo-Australian species of Chirolophius

a. Origin of ventrals midway between symphysis of lower jaw and gill opening. Caudal rays simple 1. *C. mutilus* p. 192.
b. Origin of ventrals nearer to gill opening than to lower symphysis of lower jaw . . . . 2. *C. moseleyi* p. 193.
c. Origin of ventrals almost midway between symphysis of lower jaw and base of caudal, Caudal rays forked . . . . 3. *C. papillosus* p. 194.

1. **Chirolophius mutilus** (Alcock)

Lophius mutilus Alcock, Journ. Asiat. Soc. Bengal LXII, 1893, p. 179.
Lophius lugubris Alcock, ibid. LXIII, 1894, p. 118.
Lophiodes mutilus Goode & Bean, Oceanic Ichthyol, 1895, p. 537.
Lophiodes lugubris Goode & Bean, ibid. l.c.
Lophius mutilus Alcock, Descr. Cat. Indian Deep-Sea Fishes, 1899, p. 54.
Lophius lugubris Alcock, ibid. p. 55.
Lophius (Chirolophius) quinqueradiatus Brauer, Valdivia Exp. Tiefseefische, 1906, p. 313.
Lophius (Chirolophius) lugubris Brauer, ibid. p. 314.
Lophius lugubris M. Weber, Siboga Exp. Fische. 1913, p. 557.
Chirolophius quinqueradiatus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 997.
Chirolophius mutilus Norman, Sci. Rep. John Murray Exp. 1933—34, Fishes 1939, p. 111.
Lophiodes mutilus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 426.
Lophiodes lugubris Munro, The marine and fresh water fishes of Ceylon, 1955, p. 286.

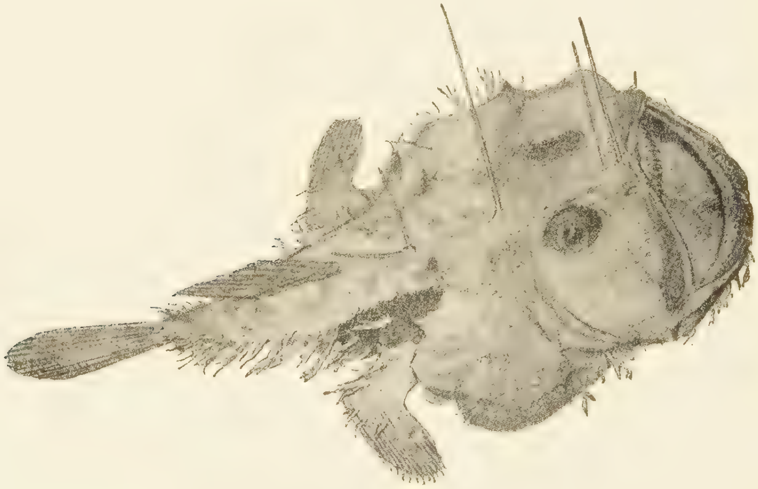

Fig. 45. *Chirolophius papillosus* (M. Weber). nat. size.

D^1. III (+ II). D^2. 8. A. 6. P. 14. V. I. 5.

Head 1.6, 2.15 in length wiht caudal. Breadth of head equal to its length. Eye 6.6, 1.6 in interorbital space and 1.7 in snout. Mouth oblique, lower jaw much projecting. Maxillary by far not reaching below eye. Fang like, more or less depressible teeth in a few rows near symphysis of upper and lower jaws, in a single series on sides. Teeth of lower jaw longer than those of upper jaw. A few similar teeth on sides of vomer and in a single row on palatines. Edge of supraorbital ridge with 3 spines. Humeral spine with 3 points. Dorsal spines flexible, the first and second on snout, the third originating immediately behind eye. Third spine longest, reaching on second dorsal and as long as distance between corner of mouth and gill opening. Fourth and fifth dorsal spines minute, hidden below the skin. Rays of second dorsal, anal, and caudal simple, and articulated. Origin of second dorsal at equal distances from base of caudal and base of third dorsal spine. Origin of anal behind that of second dorsal, end of anal below that of dorsal. Rayed part of pectorals as long as snout and eye. Ventrals half diameter of eye shorter, their origin midway between gill opening and symphysis of lower jaw. Caudal pointed. Colour of preserved specimens whitish. Length 335 mm.

Habitat: North of West Sumatra, 296 m; Bali Sea, 289 m.! — Bay of Bengal, 230 m, off Colombo, 255—720 m, Arabian Sea, Gulf of Aden, 220—549 m, East Coast of Africa, 463—977 m, Zanzibar area, 140—335 m, Natal coast, 270—450 m.

The description above is made after the single specimen, long 71 mm, collected by the Siboga Expedition. Norman (l.c.) pointed out that this species is a very variable one, the two last dorsal spines being variously reduced, hidden beneath the skin or altogether wanting. The humeral spine may have 3,4 or 5 points but in a large specimen of 335 mm length Norman found a single curved spine.

2. **Chirolophius moseleyi** Regan.

Lophius naresi Günther, Rep. Shore Fishes, Challenger, 1890, p. 56 (partim).
Chirolophius Moseleyi Tate Regan, Ann. Mag. Nat. Hist. (7) XI, 1903, p. 280.
Chirolophius moseleyi Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 475.

D^1. III + III. D^2. 8. A. 6. P. 14. V. I. 5.

Height 3.86, 5.2 in length with caudal. Head longer than broad, 1.6, 2.16 in length with caudal. Eye 6, 1.6 in snout and equal to concave interorbital space. Mouth scarcely oblique, lower jaw much projecting. Fang like, more or less depressible teeth in a few rows near symphysis of upper and lower jaws, in a single series on sides. A few similar teeth on sides of vomer and in a single row on palatines. Edge of supraorbital ridge with 3 very blunt and indistinct spines. Humeral spine simple. Dorsal spines flexible, provided with filaments, the first and second on snout, the third originating immediately behind eye. Second dorsal spine longer than third, which reaches on second dorsal and is as long as distance between corner of mouth and gill opening. Fourth to sixth spines well developed, decreasing in length to the last, which is slightly less than eye. Origin of second dorsal at equal distances from base of caudal and base of third dorsal spine. Origin of anal below second half of second dorsal, end of anal behind end of soft dorsal. Rayed part of pectorals as long as snout and eye. Ventrals slightly shorter than rayed part of pectorals, their origin nearer to gill opening than to symphysis of lower jaw, but somewhat nearer lastnamed than origin of anal. Caudal probably pointed (broken in the specimen examined). An indication of a dark, transverse band through eyes. Dorsal somewhat mottled with brown. Length of single specimen known 80 mm. (Type of the species in the British Museum examined).

Habitat: North of New Guinea, at a depth of 152 fathoms.

3. **Chirolophius papillosus** (M. Weber) (Fig. 45, p. 192).
Lophius papillosus Max Weber, Siboga Exp. Fische, 1913, p. 558.

D^1. III + III. D^2. 8. A. 6. P. 15. V. I. 5.

Head as broad as long, 1.67, 2.2 in length with caudal. Eye 4.88, 1.2 in snout and equal to the somewhat concave interorbital space. Maxillary reaching to below middle of eye. An outer row of fixed pointed teeth in the sides of the jaws, anteriorly one or two irregular rows of long, fang like, curved, depressible teeth behind them. Two curved teeth on each side of vomer. A single row of teeth on palatines. Nostrils at the end of a prominent, apparently hollow papilla, situated anteriorly on snout, behind and at the inner side of a rather strong spine. Supraorbital ridge with 3 blunt spines. Three short spines in a triangle, and connected by low ridges, behind eye. Humeral spine erected, strong, with 4 points. A strong spine before and at the inner side of humeral spine. First and second flexible dorsal spines on snout, third spine behind eye, reaching on soft dorsal. Fourth and fifth spines close together, at the level of the humeral spines, these spines much shorter than the other dorsal spines. Origin of soft dorsal somewhat nearer base of caudal than base of third dorsal spine. Origin of anal below posterior half of soft dorsal. Rays of second dorsal and anal simple. Brachial part of pectorals as long as the rayed part, which is about as long as snout and eye; their origin almost midway between base of caudal and symphysis of lower jaw. Caudal rounded, its main rays forked. A row of filaments along lower jaw and opercle, posteriorly on tail in two rows. Lateral system with conspicuous rows of papillae. Colour of preserved specimen light greyish with irregular dark blotches on rump, snout and fins, forming indistinct bands on caudal. Length of single specimen known 97 mm.

Habitat: Near Kei Islands, 360 m.!

2. **Sladenia** Tate Regan

(Tate Regan, Trans. Linn. Soc. London XII, 1908, p. 250)

Head less depressed than in other Lophiid genera. Tail deeper than broad. Lower jaw mainly with two rows of teeth. Nasal sacs with the nostrils placed anteriorly and posteriorly. The spinous dorsal with III—IV flexible spines. No trace of the third (occipital) spine of the anterior dorsal, which is so constantly present in other members of the family. The posterior spines covered with a loose fold of the skin which connects it with the soft dorsal. Soft dorsal with 9—10 rays. Anal with 6—7 rays. Pectorals with a long brachial part and 18—20 rays.

Distribution: Two Deep Sea species known, one from the Chagos Archipelago and one from Celebes.

1. **Sladenia remiger** Smith & Radcliffe (Fig. 46, p. 196)

Sladenia remiger Smith & Radcliffe, Proc. U. S. Nat. Mus. XLII, 1912, p. 199.

D^1. III. D^2. 10. A. 7. P. 20. V. I. 5.

Head 2.54 in total length, its breadth 1.2, its depth 1.54 in its length. Ventral surface a little flattened. Length of caudal peduncle 4.91 in head, its depth 4.50 in head. Eye 6, 1.33 in snout. Mouth moderate, lower jaw projecting about two thirds diameter of eye beyond upper. Maxillary reaching vertical from posterior margin of eye. Interorbital space nearly as wide as eye, slightly concave, smooth. Preorbital spine represented by a slight knob like structure covered with skin. Upper orbital rim armed with a small blunt spine anteriorly and a long slender, sharp spine posteriorly. Occipital spine relatively stout. Humeral spine absent. Mandibular teeth few in number, depressible, cardiform, rather small, mainly in two rows, the inner being the larger. Two rows of similar teeth, unequal in size, near symphysis of upper jaw, a single series of 8 nondepressible teeth on sides of premaxillary. A single canine on each side of vomer and a row of four or five similar teeth on palatines. Sides of disk and body with a few small delicate filaments. First and second dorsal spines close together, near tip of snout, thread like. Origin of the last dorsal spine much nearer tip of snout than tip of caudal. Caudal 1.54 in head. Colour in alcohol: Ground colour pale drab grey, ventral surface grey, darkest between ventrals and vent. Median portion of soft dorsal rays, anal, and ventral surface of pectorals slate black. Caudal slightly dusky. Tongue brownish. Peritoneum jet black. Length of single specimen known 137 mm. (After Smith & Radcliffe, not seen by me).

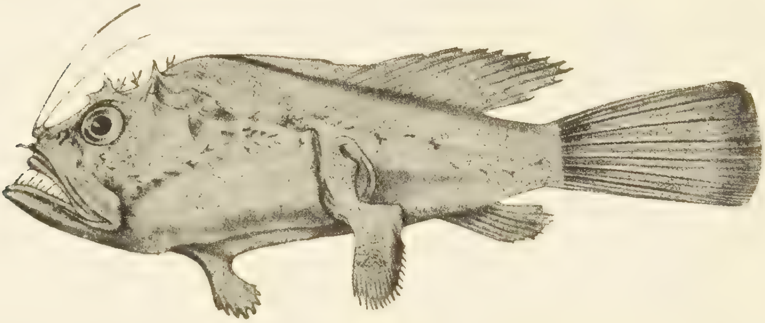

Fig. 46. *Sladenia remiger* Smith & Radcliffe. After Smith & Radcliffe.

Habitat: Celebes (Gulf of Tomini, 1165 m).

3. Family ANTENNARIIDAE

Naked or with thin rounded scales with a generally bifid erect spine, the scale concealed below the skin, the spine projecting through the skin. Compressed. Mouth protractile, more or less vertical. Gill opening small, generally immediately below base of pectorals. Spinous dorsal of III cephalic flexible spines, which may be hidden below the skin or minute. Three long pectoral radials. Small conical teeth in rows on jaws, vomer, palatines and tongue.

Key to the Indo-Australian genera of Antennariidae

A. Form rather deep. Pectorals not divided into an upper and a lower portion. Soft dorsal with 12—15 rays, anal with 6—8 rays.
  a. Dorsal spines not hidden below the skin. Last dorsal and anal rays not adnate to caudal, but exceptionally to end of caudal peduncle.

a'. Dorsal part of first gill arch with filaments in its posterior half, ventral part of this arch with filaments along its entire length. Skin smooth . . . . . 1. *Histrio* p. 197.
b'. Dorsal part of first gill arch without filaments, ventral part with only anterior half bearing filaments. Skin spinulate . 2. *Antennarius* p. 200.
b. Dorsal spines hidden below the skin. Last dorsal and anal rays adnate to basal third of caudal. Body naked . . . . 3. *Histiophryne* p. 220.
B. Form elongate. Pectorals divided into an upper and a lower portion. Soft dorsal with 18 rays, anal with 12 rays . . . . 4. *Tetrabrachium* p. 221.

Histrio Fischer

(Fischer, Zoognosia, ed. 3. I. 1813. pp. 70, 78)

Pterophryne Gill, Proc. Acad. Nat. Sci. Philadelphia (1863), 1864, p. 90 (nec Lütken 1863).
Pterophrynoides Gill, Proc. U. S. Nat. Mus. I, 1878, p. 216.

Skin naked. Dorsal part of first gill arch with filaments in its posterior half, ventral part of first gill arch with filaments along its entire length. For other characteristics see those of the single species known.

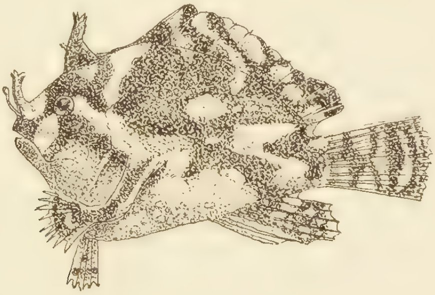

Fig. 47. *Histrio histrio* (L.) nat. size.

1. **Histrio histrio** (L.) (Fig. 47, p. 197)

Lophius histrio Linné, Syst. Nat. 10th. ed. 1758, p. 237.
Lophius histrio pictus Bloch, Schneider, Syst. Ichth. 1801, p. 141 [1]).
Lophius histrio marmoratus Bloch, Schneider, l.c.
Lophius raninus Tilesius, Mém. Natur. Mosc. XI, 1809, pl. 16.
Chironectes laevigatus Cuvier, Mém. Mus. III, 1817, p. 423.

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1) In the book this page is erroneously marked "142".

Lophius geographicus Quoy & Gaimard, Voyage Uranie & Physicienne, Zool. 1824, p. 355.
Chironectes marmoratus Lesson, Voyage Coquille, Zool. II, 1830, p. 145.
Chironectes laevigatus Cuvier & Valenciennes, Hist. Nat. Poissons XII, 1837, p. 399.
Chironectes nesogallicus Cuvier & Valenciennes, ibid. p. 401.
Chironectes marmoratus Cuvier & Valenciennes, ibid. p. 402.
Antennarius raninus Cantor, Journ. Asiat. Soc. Bengal XVIII, part 2 (1849) 1850, p. 1184.
Antennarius raninus Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 707.
Antennarius nesogallicus Bleeker, ibid. V, 1853, p. 84.
Antennarius raninus Bleeker, Acta Soc. Indo-Neerl. IV, 1858. Tiende bijdr. vischf. Celebes, p. 12.
Antennarius marmoratus Günther, Cat. Brit. Mus. III, 1861, p. 185.
Antennarius lioderma Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 178.
Antennarius marmoratus Bleeker, Atl. Ichth. V, 1865, p. 23.
Antennarius lioderma Bleeker, ibid, p. 24.
Antennarius marmoratus Kner, Novara Exp. Fische, 1865—1867, p. 192.
Antennarius marmoratus Day, Fishes of India, Part II, 1876, p. 272.
Antennarius marmoratus Günther, Fische der Südsee II, 1876, p. 162.
Antennarius marmoratus Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 211.
Antennarius marmoratus Klunzinger, Fische des rothen Meeres I, 1884, p. 125.
Antennarius histrio Lönnberg, Bih. Svenska Akad. XXII, 1896, No. 1, p. 30.
Antennarius marmoratus Steindachner, Abh. Senckenb. naturf. Ges. XXV, 1901, p. 432.
Pterophryne histrio Jordan & Sindo, Proc. U. S. Nat. Mus. XXIV (1901) 1902, p. 368.
Pterophryne ranina Jordan & Sindo, ibid. p. 369.
Pterophryne histrio Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 48.
Pterophryne marmoratus Franz, Abh. K. Bayer. Akad. Wiss. IV. Suppl. Bd. 1. Abh. 1910, p. 86.
Pterophryne histrio Snyder, Proc. U. S. Nat. Mus. XLII, 1912, p. 450.
Histrio histrio McCulloch, Austr. Zool. II, part III, 1922, p. 122.
Histrio histrio Fowler, Mem., B. P. Bishop Mus. X, 1929, p. 476.
Pterophrynoides histrio Whitley, Rec. Austr. Mus. XVII, No. 3, 1929, p. 137.
Antennarius marmoratus Duncker & Mohr, Mitt. Zool. Mus. Hamburg, 44, 1929, p. 71.
Histrio histrio Fowler, Proc. Acad. Nat. Sci. Philadelphia 87, 1936, p. 408. — Hongkong Nat. 6. Suppl. 1938, p. 52.
Histrio histrio J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 431.
Histrio histrio Munro, The marine and fresh water fishes of Ceylon, 1955, p. 288.
Histrio histrio Schultz, Proc. U. S. Nat. Mus. 107. 1957, p. 102.

D. 1 + 1 + 1 + 10.2 or 9.3. A. 2.5. P. 10. V. 5.

Height 1.5—2.1, 2.1—2.9 in length with caudal. Distance between tip of snout and gill opening 1.8—2.1, 2.3—2.9 in length with caudal. Eye 7.6—13.2, 1.2—2.2 in snout and 1.5—3.5 in convex interorbital space. Mouth very oblique, almost vertical, lower jaw projecting.

Long, slender, somewhat curved teeth in the upper and in the lower jaw, anteriorly in two or three rows, posteriorly in a single row, on vomer and palatines in about three rows. In young specimens the teeth are uniserial, but biserial anteriorly in the lower jaw. Skin either naked or covered with minute semiglobular papillae. Tentacles on head and in more or less distinct rows on body and tail, more numerous on belly. First dorsal spine a little more than half length of second, on the base of which it is inserted, the swollen end bears a number of small tentacles. Second dorsal spine generally shorter than third one, which has a low posterior membrane. Skin, covering both spines, with tentacles. Eighth ray of soft dorsal longest, about equal to distance between corner of mouth and axil of pectoral. The last two or three rays are deeply forked. Origin of rounded anal below posterior half of soft dorsal; longest anal ray about as long as that of dorsal. Both fins end at a considerable distance from base of caudal. Brachial part of pectorals almost as long as the fan like rayed part, which is as long as the maxillary. All pectoral rays simple. Ventrals as long as distance between eye and base of pectorals. Least height of caudal peduncle equal to or slightly less than its length, measured from end of dorsal. Caudal slightly rounded. Colour of preserved specimens yellowish, sides of head, body, and tail with irregular, anastomosing, dark brown bands, reduced to spots on the belly, or belly uniform. Rarely the bands on body are reduced to irregular blotches. Small white spots, larger in small specimens, scattered on sides of body present or absent. Soft dorsal and anal with oblique, dark, more or less broken bands, similar vertical bands on caudal. Brachial part of pectorals with irregular dark marmorations, rayed part of fin with irregular bands or blotches. Ventrals with short, dark, longitudinal and transverse bands, more or less broken into spots. Length over 230 mm.

Habitat: Banka; Celebes (Makassar, Badjoa!); Strait Makassar!; Strait Buton!; Flores Sea!; Tanah Djampea!; Solor; Ternate; Ceram; Ambon; Gisser!; Goram; Banda Sea!; Misol; Aru Islands!; Waigeu; seas round New Guinea. — All tropical and most subtropical seas; pelagic, living in clusters of algae, but also found on reefs.

Note. The extensive distribution of this species is probably due to its pelagic habits. Many colour varieties have been described as separate species, but apparently these are not restricted to geographical limits and hence cannot be considered as subspecies. Still, among the five varieties mentioned by Günther (1861, l.c.)

Bleeker found only the var. *ranina* and *marmorata* in the Indo-Australian Archipelago. The above description is based on Indo-Australian specimens only; they too belong to the same two varieties. In the list of literature and synonyms reference to descriptions of Atlantic specimens have been ommitted.

Lönnberg, who examined typical specimens of *Lophius histrio* L. in the University Museum of Uppsala, says (l.c.) that they agree with *marmoratus,* and not with *histrio,* as both described by Günther (1861).

2. **Antennarius** Cuvier

(Cuvier, Règne Animal, Ed. 1. II, 1817, p. 310)

Compressed. Head, body and tail naked or covered by small scales which are generally flat and provided with more or less projecting spinules. Fleshy filaments may be present on head, body, and tail. Gill opening a small rounded opening below and somewhat behind origin of pectoral. Dorsal part of first gill arch without filaments, ventral part with only anterior half bearing filaments. Mouth vertical or nearly so, the lower jaw somewhat projecting. Sharp, pointed, generally somewhat curved and depressible teeth in the jaws, in two patches on vomer and in a patch on each palatine. The dorsal fin consists of three isolated spines, the first and second close together on the snout, the third on the head behind the eye, and a second part of 12—14 rays which may be simple or partly, or all forked. The first dorsal spine (illicium) is a shorter or longer flexible stalk with filaments of different shape and number at its end. Second and third

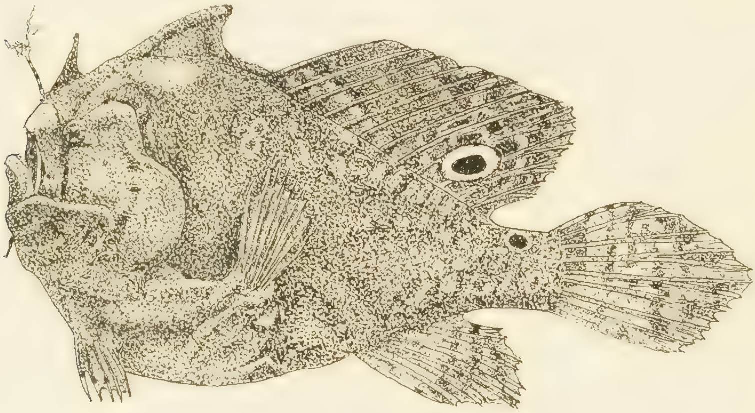

Fig. 48. *Antennarius notophthalmus* Blkr. nat. size.

spines with a more or less developed posterior membrane. Anal with 6—8 rays, all forked or partly forked. Pectorals with the brachial part well developed, forming an elbow. Ventrals small with 5 simple rays, or 4 simple, and one forked ray. Caudal more or less rounded.

Distribution: Tropical parts of all oceans.

Key to the Indo-Australian species of Antennarius

- A. No distinct caudal peduncle. D. and A. ending near base of caudal.
  - a. Second dorsal spine straight. Third totally covered by skin. P. 11. No smooth pit behind second dorsal spine 1. *A. bigibbus* p. 202.
  - b. Second dorsal spine hooked at end. Third movable. P. 9-10. A smooth pit behind second dorsal spine . . . . . 2. *A. coccineus* p. 203.
- B. A distinct caudal peduncle. D. and A. ending at some distance from base of caudal.
  - a. Head and body with conspicuous warts. Teeth in jaws small, in several rows 3. *A. phymatodes* p. 204.
  - b. No warts.
    - a^1. A. 8. P. 11. No smooth pit behind second dorsal . . . . 4. *A. moluccensis* p. 206.
    - b^1. A. 6—7. P. 9—10 (seldom 11).
      - a^2. No smooth pit behind second dorsal spine.
        - a^3. First dorsal spine much shorter than third and about equal to second. Dark with small light spots. . . . . . 5. *A. dorehensis* p. 207.
        - b^3. First dorsal spine much longer than second and third.
          - a^4. All 13 dorsal rays forked 6. *A. caudimaculatus* p. 207.
          - b^4. Last 3 dorsal rays only forked . . . . 7. *A. chironectes* (adult) p. 209
      - b^2. A smooth pit behind second dorsal spine.
        - a^3. First dorsal spine ending in 2 or 3 long simple tentacles. A. 6—7 . . . . 8. *A. pinniceps* p. 211.
        - b^3. End of first dorsal spine different.
          - a^4. A. 6—7. White with minute dark dots . . . . 9. *A. leucosoma* p. 214.
          - b^4. A. 7. Colour different.
            - a^5. First dorsal spine long, much longer than third spine . . . . 7. *A. chironectes* (young) p. 20

b⁵ First dorsal spine not very long, not much longer than third spine. No ocelli. P. 10 . . . 10. *A. hispidus* p. 214.

c⁵. First dorsal spine as long as second, shorter than third. A dark ocellus on posterior part of second dorsal. P. 9 . . . . 11. *A. notophthalmus* p. 216.

d⁵. First dorsal spine as long as or shorter than second. P. 10. A dark ocellus on posterior part of second dorsal 12. *A. nummifer* p. 217.

1. **Antennarius bigibbus** (Lac.)

Lophius bigibbus Lacepède, Hist. Nat. Poissons I, 1798, p. 325.
Chironectes tuberosus Cuvier, Mém. Mus. Hist. Nat. III, 1817, p. 432.
Chironectes tuberosus Cuvier & Valenciennes, Hist. Nat. Poissons XII, 1837, p. 428.
Chironectes reticulatus Eydoux & Souleyet, Voyage Bonite. Zool. I. Part II, 1841, p. 186.
Antennarius tuberosus Bleeker, Nat. Tijdschr. Ned. Indië XV, 1858, p. 463.
Antennarius bigibbus Günther, Cat. Brit. Mus. III, 1861, p. 199.
Antennarius bigibbus Bleeker, Atl. Ichth. V, 1865, p. 21.
Antennarius bigibbus Günther, Fische der Südsee II, 1876, p. 165.
?*Antennarius tuberosus* Fowler, Proc. Acad. Nat. Sci. Philadelphia LV, 1903, p. 174.
Antennarius bigibbus Jenkins, Bull. U. S. Fish Comm. XXII (1902) 1904, p. 511.
Antennarius bigibbus Jordan & Evermann, ibid. XXIII (1903) 1905, p. 520.
Antennarius bigibbus Barnard, Ann. S. Afric. Mus. XXI, part 2, 1927, p. 1001.
Antennarius bigibbus Fowler; Mem. B. P. Bishop Mus. X, 1928, p. 479.
Antennarius bigibbus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 430.
Antennarius bigibbus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 289.
Antennatus bigibbus Schultz, Proc. U. S. Nat. Mus. 107, 1957, p. 80.

D. 1 + 1 + 1 + 12. A. 7. P. 11. V. 5.

Height 1.78, 2 in length with caudal. Head 2,2, 2,4 in length with caudal. Eye 10, 1.4 in snout and 2.8 in interorbital space. Mouth almost vertical. First dorsal spine without tentacles at its end much longer than second spine which is straight and as long as eye. Third spine longer than second, covered by skin and pressed to the body by the short posterior membrane. No smooth pit behind second dorsal spine but a very small depression only, covered by spines as the rest of the skin and a little more distinct in a small specimen of 32 mm than in a larger one of 56 mm. Rayed dorsal rather low, the longest ray twice diameter of eye. Anal somewhat deeper than dorsal, both fins attached to caudal peduncle at base of caudal. Caudal slightly rounded. Head, body and tail covered by small spinules which are mostly bifid. Colour of preserved specimens greyish with traces of the original orange colour. Head, body and tail as well as the vertical fins with black stripes, forming marmorations and often thickened to form irregular blotches. A broad, black, transverse band on caudal. Length 200 mm. (Description made after two specimens of Bleeker's collection, 32 and 56 mm total length, in the Leiden Museum. Type of *Chironectes tuberosus* Cuvier in the Paris Museum examined).

Habitat: Ambon!; Ceram. — Coast of Natal, Madagascar, Zanzibar, Mauritius!, Ceylon, Philippines, West Australia, Solomon Islands, New Hebrides, Society Islands, Tuamotu Islands, Hawaii.

2. **Antennarius coccineus** (Less.)

Chironectes coccineus Cuvier, "Gal. du Mus. de Paris" (fide Lesson, nomen nudum).

Chironectes coccineus Lesson, Voyage Coquille, Zool. 1830, p. 143.

Chironectes coccineus Cuvier & Valenciennes, Hist. Nat. Poissons XII, 1837, p. 430.

Antennarius nummifer Bleeker, Nat. Tijdschr. Ned. Indië VI, 1854, p. 497 (nec Cuvier).

Antennarius coccineus Günther, Cat. Brit. Mus. III, 1861, p. 191.

Antennarius coccineus Bleeker, Atl. Icth. V, 1865, p. 22.

?*Antennarius coccineus* Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 499.

Antennarius nummifer Günther, Fische der Südsee II, 1876, p. 164 (partim?).

Antennarius coccineus Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 213.

Antennarius coccineus Klunzinger, Fische des rothen Meeres I, 1884, p. 126.

Antennarius nummifer Boulenger, Ann. Mag. Nat. Hist. (6) XX, 1897, p. 373 (nec Cuv.).

Antennarius leucus Fowler, Proc. Acad. Nat. Sci. Philadelphia LXXXVI, 1934, p. 512.

Antennarius punctatissimus Fowler, ibid. XCVIII, 1946, p. 216.

Antennarius coccineus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress, 1950, p. 431.

Antennarius coccineus Schultz, Proc. U. S. Nat. Mus. 107, 1957, p. 97.

D. 1 + 1 + 1 + 10.2 (or 10.3 or 11.1). A. 7. P. 9—10. V. 4.1.

Height 1.5—1.9, 2.2—2.3 in length with caudal. Head 1.4—1.9, 1.88—2.3 in length with caudal. Eye 5.1—10, equal to or more than snout, 1—2.2 in interorbital space. Mouth almost vertical. Pointed teeth in several rows in the jaws, the inner series with elongate and caninoid teeth. Pointed teeth in four patches on palate. Lower part of iris with a rounded projection, covering lower part of pupil. First dorsal spine as long as second spine, in rest bent backwards and fitting with its knob like end, consisting of a number of small fleshy tentacles, in a smooth skinned pit behind second dorsal spine. End of second dorsal spine bent backwards into a hook. Third spine longer than second, more or less pressed to the body by its posterior membrane. Dorsal rays slightly increasing in length to the tenth, the posterior rays again shorter. One, two, or three posterior dorsal rays forked, the others simple. Anal less deep than second dorsal, both fins attached to caudal peduncle at, or very close to, base of caudal. Brachial part of pectorals shorter than rayed part. Often the right or left pectoral has 9, the other 10 rays. Last ventral ray deeply forked, the others simple. Caudal rounded. Head, body, and tail covered with small spines which are mostly bifid. Larger ones on upper part of head, on second and third dorsal spines and on first dorsal ray. Short filaments scattered over sides of head and body. Colour of preserved specimens light pinkish with indications of dark blotches above pectorals and at base of posterior part of second dorsal. In life red, often with a lighter ocellus above pectoral, and with dark, irregular blotches on head, body, and tail. Length 115 mm. (Type examined in the Paris Museum).

Habitat: Singapore; Nias; Java (Patjitan); Sangi Islands; Sula Besi!; Kabaëna!; near Saleyer!; Buru; Ambon; Ceram!; Gisser!; Goram; Timor! — Coast of Natal, Mauritius!, Réunion, Red Sea, Chagos Archipelago, Cocos Keeling Islands, Philippines, Australia, Lord How Island, Rotuma!, Marshall Islands, Samoa, Tonga and probably beyond [1]).

Note: Bleeker originally determinated his specimens of *coccineus* as *nummifer* Cuv. but later on (Atlas Ichth. l.c.) he got the true *nummifer* in hand and found out his mistake. However, he was not sure if his specimens belonged to *coccineus,* as the figure in the atlas of the "Coquille" shows a fish with a distinct caudal peduncle, whereas in Bleeker's specimens the dorsal and anal end close to the base of the caudal. Bleeker supposed that the figure was inaccurate. I had the opportunity to examine the type of *coccineus* in the Paris Museum. Bleeker's supposition is right, the type exactly agrees with Bleeker's description.

3. **Antennarius phymatodes** Blkr

Antennarius phymatodes Bleeker, Acta Soc. Sci. Indo-Neerl. II, 1857. Achtste bijdr. vischfauna Amboina, p. 69.

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[1] See note at *A. nummifer.*

Antennarius oligospilos Bleeker, ibid. p. 70.
Antennarius phymatodes Günther, Cat. Brit. Mus. III, 1861, p. 198.
Antennarius Güntheri Bleeker, Atl. Ichth. V, 1865, p. 10.
Antennarius phymatodes Bleeker, ibid. p. 11.
Antennarius oligospilus Bleeker, l.c.
Antennarius oligospilus Max Weber, Siboga Exp. Fische, 1913, p. 561.
Antennarius phymatodes Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 478.
Antennarius oligospilus Fowler, ibid. p. 479.
Antennarius oligospilos J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress, 1950, p. 431.

D. 1 + 1 + 1 + 10.2 (or 11.1). A. 7. P. 10. V. 4.1.

Height 1.4—1.5, 1.8—1.9 in length with caudal. Head 1.4—1.6, 1.8—2 in length with caudal. Eye 6.9—8.5, equal to or somewhat less than snout and 1.4—1.7 in interorbital space. Mouth vertical. Lower lip with a row of small tentacles. Small pointed teeth in several rows in both jaws, separated at symphysis by a kind of fleshy frenulum. Teeth on vomer and palatines in several rows, forming oval patches. First dorsal spine (illicium) much longer than second spine, reaching to middle of third spine, which is more or less adnate to back by its short posterior membrane. Dorsal rays subequal, about equal to distance between pupil and corner of mouth, excepting the first and the two posterior ones, which are shorter. The two posterior rays or only the last ray forked. Anal rounded, the median rays longest and scarcely shorter than dorsal rays. All anal rays forked. Brachial part of pectorals short. Four ventral rays simple, the last one forked. Caudal rounded. Body covered with numerous small flat scales, some of them ending in a blunt spine or in two spines. Numerous, more or less prominent round warts, somewhat smaller than eye, on sides of body; not developed in a young specimen of 25 mm total length. Colour of preserved specimens light yellowish or reddish brown. A light yellow, brown, or pink band from base of second dorsal obliquely downwards, broadening on cheeks and sending one branch forwards which may attain eye, another backwards which may be wanting. Warts generally pink or in a pink patch. Such pinkish patches often on caudal peduncle. Head, body, and tail with more or less developed round black blotches of several size, often a large one on middle of base of second dorsal and on anal. Length 135 mm. (Typical specimens of *A. güntheri, A. phymatodes,* and *A. oligospilus* of Bleeker's collection in the Leiden Museum, examined).

Habitat: Ambon!; Nusa Laut!; Ceram; N. coast of New Guinea. — Coast of E. Africa, Queensland, Society Islands.

Note. Schultz (Proc. U. S. Nat. Mus. 107, 1957, p. 90) supposed that *A. phymatodes* has no branched rays except those of the caudal. However, Bleeker mentions branched rays in the dorsal and anal fins, what I could verify when examining the type. Hence the specimen from Ifaluk Atoll, examined by Schultz, does not belong to *phymatodes*.

4. **Antennarius moluccensis** Blkr

Chironectes commersonii Cuvier, Mém. Mus. Hist. Nat. III, 1817, p. 431 (nec Shaw).

Chironectes commersonii Cuvier & Valenciennes, Hist. Nat. Poissons XII, 1837, p. 426 (nec Shaw).

Antennarius moluccensis Bleeker, Nat. Tijdschr. Ned. Indië VIII, 1855, p. 424.

Antennarius moluccensis Günther, Cat. Brit. Mus. III, 1861, p. 191.

Antennarius commersoni Günther, ibid. p. 192 (pro parte).

Antennarius goramensis Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 177 — Atl. Ichth. V, 1865, p. 17.

Antennarius moluccensis Bleeker, Atl. Ichth. V, 1865, p. 17.

Antennarius commersonii Günther, Fische der Südsee II, 1878, p. 163 (pro parte).

Antennarius commersonii Waite, Rec. Austr. Mus. IV, 1901, p. 47 (nec Shaw).

Lophiocharon goramensis Whitley, Austr. Zoologist X, Part 1, 1941, p. 45.

Antennarius moluccensis Schultz, Proc. U. S. Nat. Mus. 107, 1957, p. 91.

D. I + 1 + 1 + 13—14. A. 8. P. 11. V. 5 (6).

Height 1.23—1.29, 1.55—1.6 in length with caudal. Head 1.8—2.4, 2.24—3 in length with caudal. Eye 13—20, 3.6—4.6 in snout and 4—5.5 in interorbital space. Mouth vertical. Five to six rows of slender, pointed teeth in the jaws and in four patches on palate. First dorsal spine (illicium) much longer than second spine and about as long as or somewhat shorter than third spine, ending in a tufted knob. Second dorsal spine with a well developed posterior membrane, reaching to base of third spine. No smooth pit between second and third spines. Third spine with a well developed posterior membrane, reaching to base of rayed dorsal. Two posterior rays of the dorsal forked, the rest simple. Most anal rays forked. All pectoral and ventral rays simple or fifth ventral ray forked. Generally 11 pectoral rays, but in the type specimen of *moluccensis* the left pectoral has 10 rays. Caudal rounded. Length of caudal peduncle 1.26—1.33 in its least depth. Colour of preserved specimens dark brown, marmorated with still darker stripes; dark ocelli below membrane of third dorsal spine, below base of dorsal and on sides of body. Fins marmorated as body, caudal with transverse stripes (*moluccensis*). In other specimens the dark stripes are broader, forming large, irregular, branched patches. Pink blotches may be present on second and third dorsal spines, on base of soft dorsal, posterior part of soft dorsal, caudal peduncle, caudal, anal, and on sides. Caudal with coarser transverse bands. Light ocelli below base of soft dorsal (*goramensis*). In still other specimens the whole fish is chocolate brown, the tips of the ventral and pectoral rays white (*commersonii* Cuvier). In all colour varieties the stalk of the illicium is ringed black and white. Length 260 mm. (Types of *A. moluccensis* and *goramensis* in the Leiden Museum, and of *Chironectes commersonii* Cuvier in the Paris Museum, examined).

Habitat: Celebes (Gorontalo!); Ambon; Goram!; Misol. — Mauritius!, Queensland, Lord Howe Island, Society Islands, Hawaii.

Note. For a discussion of the species *moluccensis* and *commersoni* see the note below the latter species.

5. **Antennarius dorehensis** Blkr

Antennarius dorehensis Bleeker, Acta Soc. Sci. Indo-Neerl. VI, 1859, Bijdr. kennis vischfauna N. Guinea, p. 21. — Atl. Ichth. V, 1865, p. 19.
Antennarius dorehensis Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 478.
Antennarius dorehensis Herre, Copeia 1945, No. 3, p. 149.
Antennarius dorehensis Whitley, The Austr. Zoologist XII, no. 4, 1959, p. 321.

D. 1 + 1 + 1 + 8.4. A. 7. P. 9. V. 5.

Height 1.46—1.7, 2.13—2.26 in length with caudal. Head 2—2.2, 2.5—2.6 in length with caudal. Eye 9—12.2, 1.2—2 in snout and 2—2.7 in interorbital space. Mouth vertical. First dorsal spine (illicium) short, with a small tassel of filaments at its end, about as long as second spine which is about half as long as third spine. No smooth pit behind second dorsal spine. Anterior dorsal rays simple, the four posterior ones forked. All anal rays forked. Caudal rounded. Length of caudal peduncle 1.3 in its least depth. Colour of preserved specimens brown with indistinct, small, white spots. A black blotch at base of soft dorsal below the 9th—10th rays. Length 69 mm. (Typical specimens of Bleeker' collection in the Leiden Museum examined).

Habitat: New Guinea (Manokwari! Bat Island). — Philippines.

6. **Antennarius caudimaculatus** (Rüpp.)

Chironectes caudimaculatus Rüppell, Neue Wirbelthiere, 1835—1840, p. 141.
Antennarius urophthalmus Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 488.
Antennarius Lindgreeni Bleeker, ibid. VIII, 1855, p. 192.
Antennarius lindgreeni Günther, Cat. Brit. Mus. III, 1861, p. 192.
Antennarius urophthalmus Günther, l.c.
Antennarius caudimaculatus Günther, ibid. p. 197.
Antennarius caudimaculatus Bleeker, Atl. Ichth. V, 1865, p. 15.

Antennarius urophthalmus Dönitz, Sitzber. Ges. naturf. Freunde, 1867, p. 6.
Antennarius caudimaculatus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 500.
Antennarius caudimaculatus Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 213.
Antennarius caudimaculatus Klunzinger, Fische des rothen Meeres I, 1884, p. 126.
Antennarius lithinostomus Jordan & Richardson, Bull. Bur. Fish. XXVII (1907) 1908, p. 286.
Antennarius chironectes Max Weber, Siboga Exp. Fische, 1913, p. 562 (nec Lac.).
Lophiocharon caudimaculatus Schultz, Proc. U. S. Nat. Mus. 1957, p. 82.

D. 1 + 1 + 1 + 12.1 or 13. A. 1.6. P. 8—9. V. 5.

Height 1.6, 2—2.4 in length wiht caudal. Head 1.9-2, 2.1—2.3 in length with caudal. Eye 6.7—9.4, about equal to snout and 1.2—1.6 in interorbital space. Mouth vertical or nearly so. Large, pointed, recumbent teeth in few rows in the jaws, slightly smaller ones on vomer and palatines. First dorsal spine (illicium) longer than second spine, provided with some narrow filaments at its end. Second dorsal spine with a well developed posterior membrane, reaching to base of third spine which is movable, its posterior membrane not being very short, its length equal to distance between pupil and corner of mouth. Dorsal rays subequal, about as long as third spine, and all forked, but sometimes the last and shorter ray is simple. Anal rounded, the longest rays not shorter than dorsal rays. Brachial part of pectorals short, all pectoral rays simple and not forked as Bleeker says by mistake in the Atlas Ichth., l.c. Generally 9 pectoral rays, in one specimen examined the right pectoral has 8 rays. Ventrals with five simple rays. Caudal slightly forked. Head, body, and tail covered by strong, flat, bicorned scales. No scaleless pit behind second dorsal spine. Small fleshy tentacles on chin, and scattered on sides of head and body. Colour of preserved specimens yellowish with more or less distinct darker marmorations, sometimes a dark blotch at middle of base of dorsal, and sometimes more or less dark edged light ocelli on sides and on caudal peduncle, immediately below end of dorsal. These specimens which resemble *A. chironectes* in this respect, have been described as *A. lithinostomus*. The specimen mentioned by Max Weber, l.c. as *A. chironectes* belongs to this form which has about three transverse rows of large, transparent, dark edged ocelli on the caudal. Other specimens which lack the ocelli on the sides have also the same transparent ocelli on the caudal, but according to authors they can change into dark blotches in old specimens. Length 165 mm.

Habitat: Singapore; Bintang; Biliton; Banka; Borneo (Sandakan): Sulu Archipelago!; Aru Islands. — Red Sea, Philippines, Darnley Island, North and West Australia.

Note. M. Weber (Siboga Exp. Fische, 1913, p. 562) records a specimen of 25 mm length from the Aru Islands as *A. caudimaculatus*. In its present discoloured state it does not show any of the characteristic markings of this species. The filaments are more numerous than in the adults and arranged in pairs along the lateral line. Only the four posterior dorsal rays are forked. Hence I am not convinced that it belongs to *caudimaculatus*.

7. **Antennarius chironectes** (Lac.).

Lophius chironectes Lacepède, Hist. Nat. Poissons I, 1798, p. 321.
Lophius commersonii Shaw, General Zool. V. Part II, Pisces, 1804, p. 387.
Chironectes variegatus Cuvier & Valenciennes, Hist. Nat. Poissons XII, 1837, p. 422.
Lophius sandvicensis Bennett, Narrative Whaling Voyage, vol. 2, 1840, p. 258.
Antennarius polyophthalmus Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 644.
Antennarius horridus Bleeker, ibid. V, 1853, p. 83.
Antennarius chironectes Bleeker, ibid. VI, 1854, p. 104.
Antennarius horridus Günther, Cat. Brit. Mus. III, 1861, p. 193.
Antennarius chironectes Günther, ibid. p. 197.
Antennarius horridus Bleeker, Atl. Ichth. V, 1865, p. 12.
Antennarius polyophthalmus Bleeker, l.c.
Antennarius chironectes Bleeker, ibid. p. 13.
Antennarius Commersonii Bleeker, ibid. p. 20.
Antennarius nigromaculatus Playfair, Proc. Zool. Soc. London, 1869, p. 239.
Antennarius commersonii Günther, Fische der Südsee II, 1876, p. 163 (pro parte).
Antennarius multiocellatus A. B. Meyer, And. Soc. Esp. Hist. Nat. XIV, 1885, p. 28 (nec C.V.).
Antennarius horridus Jatzow & Lens, Senckenb. naturf. Ges. XXI, 1899, p. 511.
Antennarius argus Fowler, Proc. Acad. Nat. Sci. Philadelphia, 55, 1903, p. 172.
Antennarius laysanius Jordan & Snyder, Proc. U. S. Nat. Mus. 27, 1904, p. 947.
Antennarius sandvicensis Jordan & Evermann, Bull. U. S. Fish Comm. XXIII (1903) 1905, p. 518.
Antennarius commersonii Jordan & Evermann, l.c.
Antennarius laysanius Jordan & Evermann, ibid. p. 520.
Antennarius commersonii Fowler, Mem. B. P. Bishop Mus. XI, No. 5, 1931, p. 367. — Proc. Acad. Nat. Sci. Philadelphia 86, 1934, p. 513.
Antennarius commersoni J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 430.
Antennarius polyophthalmus J. L. B. Smith, ibid. p. 431.
Antennarius commersoni Munro, The marine and freshwater fishes of Ceylon, 1955, p. 288.
Lophiocharon horridus Schultz, Proc. U. S. Nat. Mus. 107, 1957, p. 84.
Antennarius chironectes Schultz, ibid. p. 93.

D. 1 + 1 + 1 + 12. A. 7. P. 9—10. V. 5(6).

Height 1.4—1.6, 1.8—2.4 in length with caudal. Head 1.62—1.9, 2.09—2.39 in length with caudal. Eye 6—12, 1.6—2.2 in snout and 2—2.8 in interorbital space. Mouth vertical. First dorsal spine (illicium) without the tassel of filaments at its end as long as or slightly longer or shorter than third spine. Second spine with a short posterior membrane, about half as long as third spine and equal to or somewhat more or less than snout and eye together. A smooth pit between second and third spines in young specimens, becoming completely denticulate in adults. Rays of soft dorsal simple except the last 2—4 ones, which are forked. All anal rays forked or the anterior one simple. All pectoral and pelvic rays simple. Caudal rounded. Length of caudal peduncle 1—1.6 in its least depth. Colour of preserved specimens yellowish, reddish brown or dark brown. A light saddle on caudal peduncle may be present (*polyophthalmus, horridus*). A large, dark ocellus below base of posterior part of dorsal may be present. White edged, dark ocelli on head, body, tail and fins more or less developed, absent in dark specimens. Length: over 200 mm. (Specimens of *A. chironectes, polyophthalmus, horridus* and *commersoni* of Bleeker's collection in the Leiden Museum and a specimen of *A. multiocellatus* of A. B. Meyer's collection in the British Museum, examined).

Habitat. Singapore; Celebes!; Flores; Solor; Timor; Buru; Ceram; Ambon!; Banda!; Goram. — Coast of Natal, Zanzibar, Seychelles, Bombay , Ceylon, Andamans, Cocos Keeling Islands, Philippines, Australia, Pacific Islands eastwards to Hawaii.

Note. Schultz (l.c.) united *chironectes* and *commersoni* which orignally I had considered as distinct species. Schultz pointed out that smaller specimens (*commersoni*) have a naked area behind base of second dorsal spine which becomes completely denticulate in the larger ones (*chironectes*). I entirely agree with Schultz, as I had already some doubt about the validity of the "smooth pit" as a characteristic of *commersoni*.

Lacepède described this species as "Lophie commerson" on a manuscript of Commerson. As fin counts he gives: D2.13. A. 7. P. 10. Cuvier (Mém. Mus. Hist. Nat. III, 1817, p. 431) described as *Chironectes commersonii* a specimen which he thought to be the same as Lacepède's species, but he gives as fin counts: D 2.14 A. 8. P. 11. I have examined this specimen in the Paris museum and I can verify the fin counts. Bleeker (l.c.) described *A. commersoni* and his description, including the fin counts, correspondends with that of Lacepède. The other species of Bleeker, *A. po-*

lyophthamlmus and *A. horridus* differ only in colour from typical *commersoni* and can be united with lastnamed species, as has been done by Günther (1876, l.c.). Günther, however, lumped a great many species together as *commersoni* and amongst them *A. molluccensis* of Bleeker, but this species is identical with Cuvier's *Chironectes commersoni*. As Lacepède gave no scientific name to his species, the name *commersoni* would have been preoccupied by Cuvier's species, if Shaw (l.c.) 13 years earlier had not given the name *Lophius commersonii* to Lacepède's species. Cuvier's species hence is a synonym of *moluccensis*. As far as I know Fowler (1931, l.c.) first used Shaw's name and previous authors either cite Lacepède or Cuvier or Cuvier & Valenciennes as authors of *commersoni*. Hence it is impossible to say to which of the two species distinguished here (*moluccensis* and *chironectes*) they refer in case they give no description.

Schultz (l.c.) places *A. horridus* in the genus *Lophiocharon* on account of the first dorsal spine having a simple tentacle at its tip. However, as Bleeker already mentioned (Atl. Ichth. l.c.) this is not always the case: "apice clavato membranaceo non vel paucifimbriata", and as in other respects *horridus* is identical with *chironectes*, even in particularities of coloration, I consider it a synonym of lastnamed species.

8. **Antennarius pinniceps** Commerson

?*Lophius striatus* Shaw & Nodder, Nat. Miscell. V, 1794, pl. 175.
Lophius histrio Lacepède, Hist. Nat. Poissons I, 1798, p. 302, p. 320 (nec. L.).
?*Lophius striatus* Shaw, Gen. Zool. V, Part II, 1804, p. 385.
Antennarius pinniceps Commerson in Cuvier & Valenciennes, Hist. Nat. Poissons XII, 1837, p. 410.
Chironectes tridens Temminck & Schlegel, Fauna Japonica, Pisces, 1842, p. 159.
Antennarius tridens Bleeker, Verh. Bat. Gen. XXV, 1853. Nalez. Ichth. Japan, p. 47.
Antennarius pinniceps Bleeker, Acta Soc. Sci. Indo-Neerl. I. 1856. Beschr. vischsoorten Amboina, p. 49.
Antennarius Lacepedii Bleeker, ibid. p. 50.
Antennarius pinniceps Bleeker, Nat. Tijdschr. Ned. Indië XII, 1856—1857, p. 302.
Antennarius melas Bleeker, Acta Soc. Sci. Indo-Neerl. II, 1857. Achtste bijdr. Vischfauna Amboina, p. 70.
Antennarius pinniceps Günther, Cat. Brit. Mus. III, 1861, p. 190.
Antennarius tridens Günther, ibid. p. 191.
Antennarius tridens Bleeker, Atl. Ichth. V, 1865, p. 14.
Antennarius pinniceps Bleeker, ibid. p. 15.
Antennarius melas Bleeker, ibid. p. 20.

Antennarius pinniceps var. *fasciata* Steindachner, Sitzber. Akad. Wien LIII, 1. Abth. 1866, p. 457.
Antennarius striatus Günther, Fische der Südsee II, 1876, p. 162.
Antennarius striatus Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 212.
Antennarius pinniceps Macleay, l.c.
Antennarius tridens Jordan & Sindo, Proc. U. S. Nat. Mus. XXIV (1901) 1902, p. 372.
Antennarius tridens Franz, Abh. Bayer. Akad. Wiss. IV. Suppl. Bd. 1. Abh. 1910, p. 87, p. 111 (partim?).
Antennarius striatus McCulloch, Austr. Zoologist II, Part III, 1922, p. 123.
Antennarius striatus Barnard, Ann. S. Afrc. Mus. XXI, Part 2, 1927, p. 1001.
Antennarius striatus Fowler, Mem. B. P. Bishop Mus. X. 1928, p. 477.
Antennarius striatus McCulloch, Mem. Austr. Mus. V, 1929, p. 407.
Antennarius pinniceps McCulloch, l.c.
Antennarius tridens Wu, Contr. Biol. Lab. Sci. Soc. China. Zool. Ser. VII No. 1, 1931, p. 60.
Antennarius pinniceps Fowler, Proc. Acad. Nat. Sci. Philadelphia 86, 1934, p. 512.
Antennarius striatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 431.
Antennarius pinniceps J. L. B. Smith, l.c.
Antennarius pinniceps Munro, The marine and fresh water fishes of Ceylon, 1955, p. 289.
Phrynelox striatus Schultz, Proc. U. S. Nat. Mus. 107, 1957, p. 71.
Phrynelox melas Schultz. ibid. p. 72.
Phrynelox zebrinus Schultz. ibid. p. 75.

D. 1 + 1 + 1 + 12. A. 6—7. P. 10—11. V. 5.

Height 1.4—2, 1.88—2.5 in length with caudal. Head 1.65—2.3, 2.3—3 in length with caudal. Eye 6.9—14, 1—2.2 in snout. Interorbital space 1.4 in eye. Mouth nearly vertical. Large, sharp, pointed, somewhat curved teeth in a single row in sides of jaws, in several rows near symphysis and in four patches on palate. Lower border of iris with a projection, covering part of pupil. First dorsal spine (illicium) slightly shorter or longer than second spine, ending in two long simple filaments which may be as long as the stalk. A third shorter one, which may have side branches, may be present between them. Second spine as long as distance between lower border of eye and corner of mouth, without posterior membrane and separated from third spine by a large smooth pit. Third spine as long as distance between lower border of pupil and corner of mouth, with a short posterior membrane and hence not very movable. Soft dorsal deep, some of the rays may project beyond the membrane, the longest rays equal to distance between corner of mouth and upper end of base of pectoral. The last 2 or 3 rays of soft dorsal forked, the others simple. Anal with a short base which is less than half length of base of soft dorsal, the longest rays about as long as third dorsal spine, 3—6 of the posterior rays forked. All pectoral rays simple. Ventrals very short, as long as snout and half eye, all rays simple. Caudal rounded. Least depth of caudal peduncle 1.1—1.15 in its length. Head, body, tail, spines and rays of vertical fins covered with scales, their spinules generally long and projecting far beyond the body of the scale. Colour of preserved specimens generally yellowish with numerous dark stripes radiating from eye and from pectoral, those from pectoral directed in caudal direction on lower part of sides of body, but upwards and turned obliquely forwards on posterior part of back and continued on soft dorsal. These stripes often broken into smaller ones or broadened, forming blotches or diffuse broad bands, sometimes forming rounded spots or rings on upper part of soft dorsal. Caudal, anal, pectorals, and ventrals generally with rows of dark spots. In *A. melas* the whole fish is dark with a few black patches on cheeks and sides. Fins dark, without spots. Length 175 mm or more. (Specimens of *A. pinniceps, melas,* and *tridens* of Bleeker's collection in the Leiden Museum examined).

Habitat: Bali!; Reef "de Bril" near Macassar!; Ambon!; Misol. — East Coast of Africa, Mauritius, Ceylon, China, Korea, Japan, Philippines, Queensland, New S. Wales, Solomon Islands, Tahiti.

Note. I am not convinced that *Lophius striatus* Shaw & Nodder is this species as supposed by Günther (l.c. 1876), but I agree with McCulloch (l.c. 1922) that *pinniceps* and *striatus* as described by Günther are but varieties of the same species. The identity of *tridens* from Japan and China (once recorded from Ambon by Bleeker) and *pinniceps* has already been supposed by Bleeker. Possibly the Japanese species described by Jordan (Jordan & Sindo, l.c.) as *scriptissimus,* and *nox,* also belong to *pinniceps.* Franz (l.c.) ranges them under *tridens.* Schultz considers *nox* a valid species (*Phrynelox nox*) and *scriptissimus* a synonym of *A. hispidus.* On p. 111 of his article Franz discusses the abnormal first dorsal spines of last named species, where the long filaments are replaced by a knob with short filaments. He supposes that the long filaments often are bitten off and he gives some anatomical data which point to the possibility of regeneration. I am inclined to accept this hypothesis. Indeed, the sometimes very long filaments of the illicium in this species must be more exposed to injury than those of other species of *Antennarius.*

9. **Antennarius leucosoma** Blkr

Antennarius leucosoma Bleeker, Nat. Tijdschr. Ned. Indië VI, 1854, p. 328.
Antennarius multiocellatus var. *leucosoma* Günther, Cat. Brit. Mus. III, 1861, p. 195.
Antennarius leucosoma Bleeker, Atl. Ichth. V, 1865, p. 195.
Antennarius multiocellatus var. b, Playfair, Proc. Zool. Soc. London, 1867, p. 862.

D. 1 + 1 + 1 + 12. A. 6—7. P. 9—10. V. 5.

Height 1.4, 1.8 in length with caudal. Head 1.76—1.86, 2.26—2.4 in length with caudal. Eye 8.5—11, 1.14 in snout and 1.85—2.2 in interorbital space. Mouth vertical. Long, slender teeth in about 2 rows in jaws and in 4 patches on palate. First dorsal spine (illicium) without the rather long filaments at its end, as long as third spine. Second dorsal spine two thirds or five eighths of third spine, a smooth pit behind it. Longest dorsal rays slightly longer than third spine, the anterior rays simple, the two or three posterior ones forked. Anal less deep than soft dorsal, all rays forked. Origin of anal below posterior half of soft dorsal. Caudal rounded. Length of caudal peduncle 1.16—1.27 in its least depth. Scales very small, the skin almost smooth on touch. Colour of preserved specimens white. Head, body, tail, and fins covered with minute dark dots. A brown blotch on anterior part of base of soft dorsal, prolonged downwards to two connected rounded blotches or ocelli above base of pectoral. A similar round ocellus on 8th and 9th dorsal rays and another on the 4th anal ray. A saddle of the same colour on caudal peduncle and three rounded blotches on caudal. A few small dots of the same colour on sides. Length 68 mm. (Description made after the type in the Leiden Museum and the specimen recorded by Günther, l.c., examined in the British Museum.

Habitat: Flores!; Ambon! — Seychelles.

10. **Antennarius hispidus** (Bl. Schn.)

Lophius hispidus Bloch Schneider, Syst. Ichth. 1801, p. 142.
Chironectes lophotes Cuvier, Mém. Mus. Hist. Nat. III, 1817, p. 428.
Chironectes hispidus Cuvier & Valenciennes, Hist. Nat. Poissons XII, 1837, p. 407.
Antennarius hispidus Cantor, Journ. Asiat. Soc. Bengal XVIII (1849) 1850, p. 1185 (sine syn.).
Antennarius hispidus Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 280.
Antennarius hispidus Günther, Cat. Brit. Mus. III, 1861, p. 189.
Antennarius hispidus Bleeker, Atl. Ichth. V, 1865, p. 14.
Antennarius hispidus Day, Fishes of India, Part I, 1876, p. 271.
Antennarius hispidus Günther, Fische der Südsee II, 1876, p. 162.

Antennarius hispidus Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 48.
Antennarius hispidus Annandale & Jenkins, Mem. Indian Mus. III, No. 1, 1910, p. 20.
Antennarius hispidus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 1001.
Antennarius hispidus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 477.
Antennarius hispidus Chevey, Trav. Inst. Océanogr. Indochine, 4e Mém. 1932, p. 119.
Antennarius hispidus Fowler, Proc. Acad. Nat. Sci. Philadelphia 86, 1934, p. 513.
Antennarius hispidus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 430.
Antennarius hispidus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 289.
Antennarius hispidus Schultz, Proc. U. S. Nat. Mus. 107, 1957, p. 90.

D. 1 + 1 + 1 + 9.3. A. 7. P. 10. V. 4.1.

Height 1.8, 2.6 in length with caudal. Head 1.7, 2.4 in length with caudal. Eye 8.7, equal to snout and 1.6 in interorbital space. Mouth almost vertical. Sharp, pointed teeth in a single row in sides of upper and lower jaw, in several rows near symphysis, where many of the teeth are slender, depressible caninoids. Similar teeth in two patches on vomer and in an elongate patch on palatines. Lower border of iris with a rounded projection, covering part of the pupil. First dorsal spine (illicium) longer than second spine, articulating on a short peduncle in front of second dorsal, in rest bent backwards and fitting with its enlarged, arborescent end in a smooth skinned pit behind second dorsal spine. Second dorsal spine somewhat shorter than third spine which is more or less pressed to the body by its posterior membrane. Dorsal rays subequal, with exception of the two posterior rays which are shorter; the longest rays half length of head, the three posterior rays forked, the rest simple. Anal rounded, all rays forked, the median rays longest and somewhat longer than dorsal rays. Brachial part of pectorals much shorter than the rayed part which is about as long as snout and eye. Ventrals with the 4 anterior rays simple, the last one deeply forked. Caudal rounded, the rays forked. Least height of caudal peduncle equal to length of peduncle. Head, body, and tail densely covered with generally bifid spines which are long and slender. Area of lateral line smooth, from behind eye to below middle of soft dorsal, bordered by pairs of short, arborescent tentacles. Colour of preserved specimens light brown, with dark brown streaks on head, radiating from eye, and on body more or less radiating from base of pectorals. Second dorsal, anal, caudal, and pectorals with irregular rows of dark spots. Stalk of illicium ringed white and brown, the knob at its end with longitudinal dark streaks. Ventrals dark. Length 200 mm.

Habitat: Singapore; Lombok!; Ceram; Buru; Ambon; Misol. — Coast of Natal, Madagascar, Mauritius, Réunion, coasts of India, Ceylon, Siam, Indochina, Hongkong, Pinang, Philippines, Solomon Islands, Fiji, eastwards to Laysan, Hawaii, Fanning Islands, Society Islands. Down to 900 m.

Note. The specimens mentioned by Max Weber (Siboga Exp. Fische, 1913, p. 562) as *hispidus,* do not belong to that species but to *coccineus,* with exception of the pelagic specimens from the Flores Sea which belong to *Histrio histrio.* Hence Weber's statement that *A. hispidus* sometimes is pelagic, must be revoked.

11. **Antennarius notophthalmus** Blkr. (Fig. 48, p. 200)

Antennarius notophthalmus Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 544.
Antennarius biocellatus Bleeker, Acta Soc. Sci. Indo-Neerl. VIII, 1860. Elfde bijdr. Vischfauna Amboina, p. 4 (nec C.V.).
Antennarius notophthalmus Günther, Cat. Brit. Mus. III, 1861, p. 196.
Antennarius biocellatus Günther, l.c. (nec C.V.).
Antennarius notophthalmus Bleeker, Atlas Ichth. V, 1865, p. 16.
Antennarius biocellatus Bleeker, ibid. p. 18 (nec C.V.).
Antennarius nummifer Day, Fishes of Malabar, 1865, p. 121 (partim?)
Antennarius biocellatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 431 (nec C.V.).
Antennarius notophthalmus Schultz. Proc. U. S. Nat. Mus. 107, 1957, p. 99.

D. 1 + 1 + 1 + 12. A. 7. P. 9. V. 5.

Height 1.4—1.7, 2—2.3 in length with caudal. Head 1.6—1.9, 2—2.6 in length with caudal. Eye 7—7.9, equal to snout and 1.4—1.5 in interorbital space. Mouth vertical. About five rows of recumbent teeth of moderate size in the jaws and in four patches on vomer and palatines. First dorsal spine (illicium) as long as second spine, but shorter than third spine, ending in a knob with numerous short, slender tentacles. Second dorsal spine with a short posterior membrane, not reaching to base of third, from which it is separated by a rather deep smooth pit. Length of second spine equal to distance between pupil and corner of mouth. Third spine movable, with a well developed posterior membrane. Three or four of the posterior dorsal rays forked, the longest rays about equal to distance between base of third dorsal spine and corner of mouth. All anal rays forked or the first one simple. Anal less deep than soft dorsal. All pectoral rays simple. All ventral rays generally simple, sometimes the fifth ray is more or less forked. Caudal rounded. Scales small, generally ending in a point, sometimes with two small points on each side of the median one. More or less distinct branched filaments on chin and throat and on body and tail, especially along lateral line. Colour of preserved specimens lighter or darker brown or even bluish black. In lighter specimens sides of body and tail with darker marmorations and short black stripes radiating from the eye. A large rounded, black ocellus, encircled by a rather broad, light yellow border, on posterior part of soft dorsal. A similar, but much smaller one, may be present on caudal peduncle behind end of dorsal. Vertical fins with wavy, irregular rows of dark blotches or lines. Stalk of illicium ringed brown and white. Length 250 mm.

Habitat: Nias; Java (Djungkulon, Tjilatjap); Celebes (Macassar, Menado); Batjan; Buru!; Ceram; Ambon; Timor; North New Guinea! — Southeastern coast of Africa, Malabar coast?, China, Philippines.

Note. This species is very close to *A. nummifer* but differs in having only 9 pectoral rays and, as a rule, all ventral rays simple. Besides the third dorsal spine is much longer and the second spine has a well developed posterior membrane.

12. **Antennarius nummifer** (Cuv.)

Chironectes nummifer Cuvier, Mém. Mus. Hist. Nat. III, 1817, p. 430.
Chironectes nummifer Cuvier & Valenciennes, Hist. Nat. Poissons XII, 1837, p. 425.
Chironectes nummifer Rüppell, Neue Wirbelthiere, Fische des rothen Meeres, 1835, p. 141.
Antennarius nummifer Günther, Cat. Brit. Mus. III, 1861, p. 195.
Antennarius nummifer Day, Fishes of Malabar, 1865, p. 121 (partim?).
Antennarius nummifer Bleeker, Atl. Ichth. V, 1865, p. 18.
Antennarius nummifer Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 499.
Antennarius nummifer Day, Fishes of India, Part II, 1876, p. 272.
?*Antennarius nummifer* Günther, Fische der Südsee II, 1876, p. 164 (sine syn.).
Antennarius nummifer Klunzinger, Fische des rothen Meeres, 1884, p. 125.
Antennarius nummifer Steindachner, Abh. Senckenb. naturf. Ges. XXV, 1901, p. 433.
Antennarius sanguifluus Jordan, Proc. U. S. Nat. Mus. XXIV (1901) 1902, p. 374.
Antennarius nummifer Annandale & Jenkins, Mem. Ind. Mus. III, No. 1, 1910, p. 21.
Antennarius nummifer M. Weber, Siboga Exp. Fische, 1913, p. 561.
Antennarius nummifer Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 478.
?*Antennarius nummifer* Pietschmann, Bull. B. P. Bishop Mus. 73, 1930, p. 23.
Antennarius nummifer Munro, The marine and fresh water fishes of Ceylon, 1955, p. 289.
Antennarius nummifer Schultz, Proc. U. S. Nat. Mus. 107, 1957, p. 102.

D. 1 + 1 + 1 + 10.2 or 11.1. A. 7. P. 10. V. 4.1.

Height 1.6—1.7, 2.1—2.2 in length with caudal. Head 2—2.3, 2.6—2.9 in length with caudal. Eye 8.8—9.4, 1.4 in snout and 2.38 in interorbital space. Mouth vertical. Moderate teeth in a few rows in jaws and in four patches on palate. First dorsal spine (illicium) as long as or slightly shorter than second spine, shorter than third spine, ending in a knob with a knot of small tentacles. The second spine has a tiny posterior membrane at its base, and is separated from the third spine by a deep, smooth pit; length of second spine equal to distance between lower border of eye and corner of mouth. Third spine with a well developed posterior membrane, equal to distance between upper border of eye and corner of mouth. One or two of the posterior dorsal rays forked, the longest rays about equal to distance between base of third spine and corner of mouth. All anal rays forked or the first simple. Anal less deep than soft dorsal. All pectoral rays simple. Four ventral rays simple, the last one deeply forked. Caudal rounded. Scales small, with a concave free border, or bifid, specially above eye, or with a median long filament. Dorsal spines and soft dorsal also covered by scales. Branched filaments on chin, throat, along lateral line, on dorsal spines, and smaller ones scattered on body and tail. Colour of preserved specimens dark reddish brown or light pink. A large black ocellus, encircled by a rather broad whitish border, on base of posterior part of soft dorsal. A light blotch with a dark border on caudal peduncle and a similar light ocellus on sides below the black one of dorsal, distinct in the darker specimens. Vertical fins light with more or less distinct cloudy darker bands. Stalk of illicium generally ringed white and light brown. Length 100 mm or more. (Specimens of Bleeker's collection in the Leiden Museum examined).

Habitat: East of N. Sumatra!; Sumatra (near Aru Bay!); Borneo (Sandakan); Sumbawa!; Ambon; Ceram; Ternate; Misol!; New Guinea (Manokwari). — Red Sea, Persian Gulf!, Aden, Maldives, Kurrachee! coasts of India, Ceylon, China! Japan, Philippines, Louisade Archipelago, Sahul Bank, N. Australia! New South Wales? Carolus Island, Gilbert Islands, Lord Howe Island?, Samoa!, Society Islands?, Hawaii?

Note. This description is made after specimens from the Indo-Australian Archipelago. Day (Fishes of India, part II, 1876, p. 271) has pointed out that in specimens of *nummifer* in the British Museum those from China and the Malay Archipelago have 10 pectoral rays, but that those of Madras have 13, one from Aden 12, one from the N. W. coast of Africa 11, one from St. Helena 10. Apart from the fact that probably *nummifer* does not occur in the Atlantic and hence the two lastnamed specimens can be left out of consideration, we get the impression that two geographical races can be distinguished, an eastern one with 10 pectoral rays and a western one with more rays in the pectoral. Probably there is a difference in the colour too, for Day describes and figures a specimen which has a row of dark blotches on the vertical fins and also more blotches or ocelli on the sides than are present in specimens from the Indo-Australian Archipelago. Day's specimen agrees exactly with that from Mahé, Malabar coast, described by Valenciennes l.c. and which I examined in the Paris Museum. This specimen has 13 pectoral rays.

It is not certain how far *nummifer* extends its range eastwards into the Pacific, although it has often been mentioned from there. As mentioned under *coccineus,* Bleeker formerly described his specimens of lastnamed species as *nummifer,* but later on detected his error. Now Günther (1876, l.c.) made the mistake to place *A. coccineus* as a synonym of *nummifer* and several authors followed him. It is probable that most Pacific records of *nummifer* can be referred to *coccineus* or to the related species *A. drombus* (Jordan & Evermann, Bull. Bur. Fish. U. S. Fish. Comm. XXIII (1903) 1905, p. 521. See also Jordan & Seale, Bull. Bur. Fish. XXV (195) 106, p. 438). Among the Pacific specimens of *A. nummifer* examined by me in the British Museum I find one from Rotuma to be *coccineus,* but a specimen from Samoa, coll. Schmeltz, and another from the same locality, presented by the Rev. S. J. Whitmee, do not differ from Indo-Australian specimens of *nummifer,* as also a specimen from the China Seas and one from Sahul Bank, N. Australia. Among the Indic specimens in the British Museum those from Kurrachee and Persia also are identical with Indo-Australian specimens of *nummifer.* All of them have 10 pectoral rays, except one of two specimens from Head of Persian Gulf which has 11 rays, the other having 10 rays in the pectoral. A large specimen, 275 mm long, from Muscat, recorded by Boulenger (Proc. Zool. Soc. London 1887, p. 663) has 13 pectoral rays and also differs in colour, being yellowish brown with dark bands and reticulations on the body. A large black ocellus below soft dorsal as in typical *nummifer.* Soft dorsal, anal, and caudal with bands or rows of spots. The illicium is longer than the second dorsal spine. I am not sure that this specimen belongs to *nummifer.*

3. **Histiophryne** Gill

(Gill, Proc. Acad. Nat. Sci. Philadelphia, 1863, p. 90)

Skin smooth. Teeth cardiform, all or some of them large and depressible, present in jaws and in two patches on vomer and on palatines. Gill opening a small, rounded opening above middle of base of pectoral. First dorsal spine (illicium) small (or absent?), second and third spines separate, hidden in the skin. Soft dorsal with 13—15 rays. Anal with 7—8 rays. Last rays of soft dorsal and anal united by membranes to the basal third of the caudal, which is rounded. Pectorals with 8, ventrals with 5 rays. All rays simple, except those of caudal.

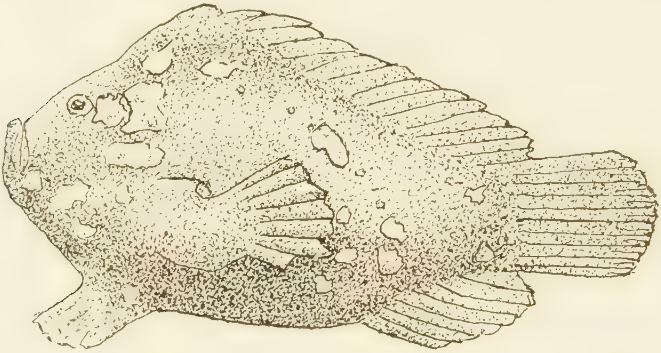

Fig. 49. *Histiophryne cryptacanthus* (M. Weber). nat. size.

Distribution: Two or three species from Australia and the Indo-Australian Archipelago.

Note. In *Histiophryne scertea* McCulloch & Waite from S. Australia (Rec. South Austral. Museum I, No. 1, 1918, p. 74) the second and third dorsal spines are free, although enveloped in thick fleshy skin, and hence this species may belong to a different genus.

1. **Histiophryne cryptacanthus** (M. Weber) (Fig. 49, p. 220)

Antennarius cryptacanthus Max Weber, Siboga Exp. Fische, 1913, p. 564.
Antennatus (*Xenophrynichthys*) *cryptacanthus* Schultz. Proc. U. S. Nat. Mus. 107. 1957, p. 81.

D. O? + 1 + 1 + 13. A. 7. P. 8. V. 5.

Height 1.8, 2.2—2.3 in length with caudal. Head 1.5—1.8, 2.2—2.4 in length with caudal. Eye 8.6—10.8, 1.3—1.4 in snout and 1.7—2.6

in convex interorbital space. Mouth very oblique. Sharp, depressible teeth in two rows in the jaws, those of the inner row stronger than those of the outer row, especially in the lower jaw. Similar pointed teeth in four patches on palate. First dorsal spine (illicium) wanting. Second and third dorsal spines completely covered by thick, fleshy skin and hardly visible without dissection. Dorsal, anal, and caudal rays broad, also covered by rather thick skin. All rays simple with exception of those of the caudal. Brachial part of pectorals short. Ventrals very short. Skin thick, forming a prominent transverse fold on the chin which in the largest of the two specimens examined is provided with warts which bear short, skinny filaments. Similar warts also on cheeks and sides of occiput. Small filaments scattered over the body and arranged along the lateral line which has a curve far above pectorals. Colour of preserved specimens yellowish, in the smaller specimen head, body, and tail have large dark blotches. The filaments on warts are rose coloured. Length 85 mm. (Description made after the type and cotype in the Amsterdam Museum).

Habitat: Karakelang!; Rotti!. On muddy bottom, depth 13—45 m.

Note. No trace of an illicium could be detected. Weber says that all 3 dorsal spines are hidden below the skin, but I could find but two, corresponding to the second and third spines of *Antennarius*. It is not impossible that the illicium is broken in the specimens examined, but there is no sign that this has happened.

Schultz (l.c.) ranges this species under the new genus *Antennatus* which is characterized under more by: "the head, body, and fins basally thickly covered with close-set prickles on firm skin". *A. cryptacanthus*, however, has the skin completely smooth, as already mentioned by Weber. Moreover, in *Antennatus* the anal rays are branched. Hence I have placed it in the genus *Histiophryne*. It differs from all known species of Antennarids by having apparently all dorsal spines hidden below the skin. Therefore Schultz created the new subgenus *Xenophrynichthys* for this species. It can now be considered as a subgenus of *Histiophryne*, but when more material will be available, it is not impossible that *Xenophrynichthys* must have genus-rank.

4. **Tetrabrachium** Günther

(Günther, Challenger Exp. Zool. I, Part VI, 1880, p. 44)

Compressed. Skin naked. Mouth vertical, narrow. Teeth very small. Eye small, projecting on upper surface of head. Gill opening a small foramen at the lowermost part of the root of the pectoral fin. Dorsal consisting of 3 small isolated spines, the first and second close together, situated above the upper lip, the third on the middle of the nape, and of a soft part with 18 rays. Pectorals of 4 rays, detached from the lower part of 5 rays, the inner ray of which is attached to the body in its whole length. Ventrals with 5 rays, attached to the sides of the body. Caudal rounded.

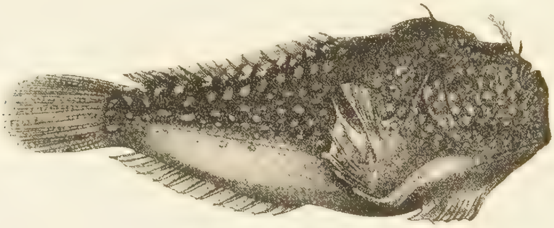

Fig. 50. *Tetrabrachium ocellatum* Gthr. After Günther.

Distribution that of the single species known.

1. **Tetrabrachium ocellatum** Gthr. (Fig. 50, p. 222)

Tetrabrachium ocellatum Günther, Challenger Exp. Zool. I, Part VI, 1880 p. 45.
Tetrabrachium ocellatum Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 476.
Tetrabrachium ocellatum Whitley, Rec. Austr. Mus. XIV, 1935, p. 249.

D. 1 + 1 + 1. 18. A. 12. P. 4.5. V.5

Greatest height at nape, 2.24, 2.8 in length with caudal. Head 2.2, 2.76 in length with caudal. First dorsal spine very short and slender, the second as long as the mouth and fringed, the third again very small and delicate. Eyes 12.5, equal to interorbital space, covered by the general integument. Last dorsal ray connected by membrane to caudal. Anal free from caudal. The upper half of the fish is brownish, with numerous white ocelli greatly varying in size; they extend on the dorsal fin, but all the other fins are white, without any spots. Length 69 mm. (Type seen in British Museum).

Habitat : South of New Guinea, 50 m. — Queensland!

4. Family CHAUNACIDAE

Body covered with small spines. Head very large, cuboid. Mouth vertical. Gill openings small rounded openings at some distance behind and above base of pectorals. Spinous dorsal consisting only of a short illicium which can be withdrawn into a smooth cavity on the snout. Soft dorsal and anal well developed. Three pectoral radials.

1. **Chaunax** Lowe

(Lowe, Trans. Zool. Soc. London III, 1846, p. 339)

For characters of the single genus see those of the family.

1. **Chaunax pictus** Lowe (Fig. 51, p. 223)

Chaunax pictus Lowe, Trans. Zool. Soc. London III, 1846, p. 339.
Chaunax pictus Günther, Cat. Brit. Mus. III, 1861, p. 200. — Rep. Deep-Sea Fish. Challenger Exp. Zool. XXII, 1887, p. 58.
Chaunax pictus Goode & Bean, Oceanic Ichthyology, 1895, p. 487.
Chaunax pictus Alcock, Descr. Cat. Indian Deep-Sea Fishes, 1899, p. 58.

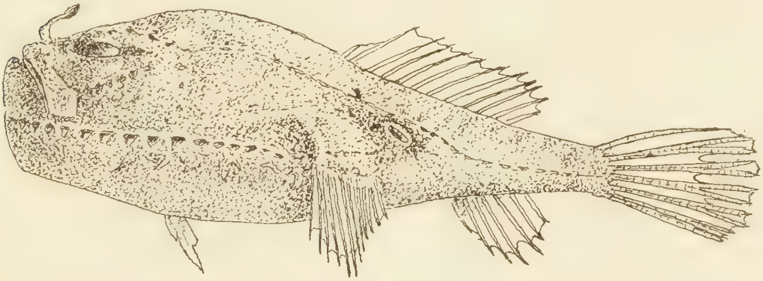

Fig. 51. *Chaunax pictus* Lowe. 4/5 nat. size.

Chaunax pictus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 1003.
Chaunax pictus Norman, Sci. Rep. John Murray Exp. Brit. Mus. VII, No. 1, 1939, p. 112.
Chaunax pictus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 430.
Chaunax pictus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 287.

D^1. I. D^2. 11—12. A. 7. P. 12—13. V. 3—4.

Height 3.6, 4.5—4.6 in length with caudal. Head 1.5—1.7, 1.9—2.2 in length with caudal. Eye 7.3—8.2, slightly more than snout and 1.6—1.7 in somewhat convex interorbital space. Mouth large, vertical, the broadened end of the maxillary reaching to below front-border of eye. Pointed depressible teeth in 4 or 5 rows in the jaws, in two rows on the vomer, with only a few teeth in the middle of the bone, and in two rows on each palatine. Illicium with a short stalk and a filamentous bulb, not covering the cavity in which it can be withdrawn, except in the specimen from the Flores Sea which has a shorter stalk, a larger bulb and a very shallow and short cavity. Origin of soft dorsal about above gill opening. Origin of anal below posterior part of soft dorsal. All dorsal and anal rays simple. Brachial part of pectorals below the skin, the rayed part sticking out horizontally. Origin of ventrals slightly nearer snout than base of pectorals, sometimes inverted into the loose skin of the flat underside. Caudal truncate, its rays forked. Skin covered with small, simple spines, those of the lower side much smaller. The cavity on snout and small areas behind soft dorsal and anal without spines. Mucous canals very conspicuous: a pair beginning at snout, running through interorbital space, diverging behind eye, and each branch (lateral line) running parallel along upper part of sides, bent downwards behind gill opening, and running along lower part of caudal peduncle to base of caudal, the two branches connected by a transverse canal at a distance behind eye about equal to snout. Another canal starts from the same point on snout as the pair mentioned above, runs along upper jaw, then over cheek, and ends in a short transverse canal which ends superiorly in the lateral line and inferiorly in a longitudinal canal, beginning at symphysis of lower jaw and ending at base of pectorals; a row of fleshy tentacles along this canal. Colour of preserved specimens yellowish or light pinkish. Length of specimens described 133—159 mm.

Habitat: Flores Sea, 538 m!, Arafura Sea, 204—304 m! — Deeper parts of Atlantic, Indic, and Pacific.

Note. Norman thinks it possible that the forms described as *fimbriatus, umbrinus* and *endeavouri* are simple varieties of *pictus,* and that *apus* is based on a specimen where the ventrals were inverted and hence invisible, whereas the characteristics of *pencillatus* may be sexual differences. Several other authors accept but one species of *Chaunax.*

5. Family ONCHOCEPHALIDAE

Head very large, depressed and broad, the body and tail narrow and subcylindrical or slightly compressed. Mouth small or moderate, protractile downwards. Gill opening small, above base of pectoral. Spinous dorsal represented by the illicium which has a short thick stalk and a trilobe or bulbous expansion at its end, the whole contained in a rostral cavity on anterior surface of snout above eye. Second dorsal consisting of a few simple rays, sometimes rudimentary or absent, situated at some distance behind gill opening. Anal short, its origin behind that of dorsal. Gills 2 or $2^1/_2$, no gill on first arch. Two long pectoral radials.

Key to the Indo-Australian genera of Onchocephalidae

A. Palate edentulous.

- a. Two gills, the 1st and 4th arches without lamillae. Disk subtriangular . . . . . 1. *Dibranchus* p. 225.
- b. Two gills and a half. Disk subcircular . . . 2. *Halieutaea* p. 233.

B. Palate dentigerous. Two gills.

- a. Snout produced to form a sharp projecting spine. Second dorsal well developed. Skin with large dermal ossicles . . . . 3. *Malthopsis* p. 237.
- b. Second dorsal absent or rudimentary. Skin of upper and lower sides with minute prickles, like shagreen . . .. 4. *Halicmetus* p. 239.

1. **Dibranchus** Peters

(Peters, Monatsberichte Akad. Wiss. Berlin, 1875 (1876), p. 736.
Coelophrys Brauer, Zool. Anz. XXV, 1902, p. 291.

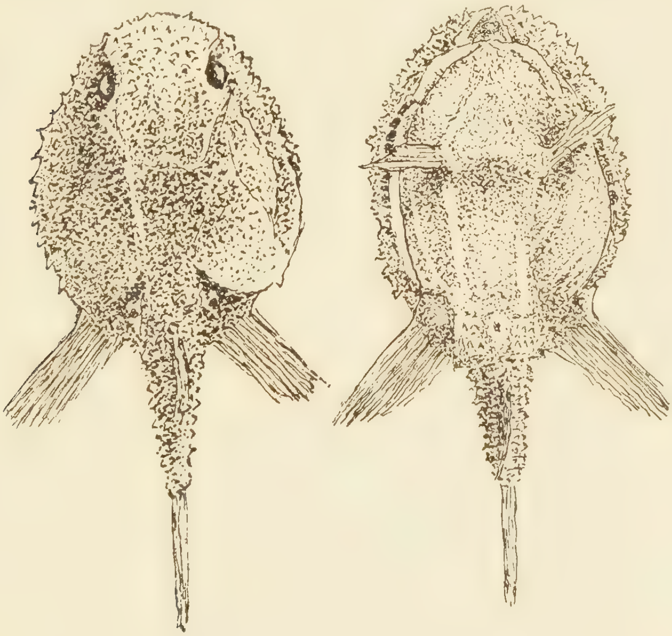

Fig. 52. *Dibranchus infranudus* n.s. nat. siz. Upper and lower side.

Disk subtriangular or oval. Mouth horizontal. Jaws with villiform bands of teeth. No teeth on vomer or palatines. Two gills, the first and fourth branchial arches without filaments. Rostral cavity roofed by a bony bridge. Illicium with a very short stalk and generally with a trilobate bulb at its end. Nostrils on snout, at sides of rostral cavity. Skin covered by more or less developed prickles on stellated bases. Lower side with less developed prickles or without prickles. Dorsal with 4—7 rays, on anterior part of body. Anal with 4 rays, totally or partly behind dorsal. Brachial part of pectorals poorly developed. Ventrals generally small, with 5 rays. Caudal truncate or slightly rounded.

Distribution: Deep Sea of Atlantic, Indic, and Pacific.

Key to the Indo-Australian species of Dibranchus

A. Head 1.7—1.8. Origin of dorsal about midway between tip of snout and tip of caudal. Head disk like.

a. Lower side of head with small spines or tubercles.

a^1. Breadth of head 1.4—1.5 in length without caudal . . . . 1. *D. nasutus* p. 226.

b^1. Breadth of head about 1.9 in length without caudal . . . . 2. *D. stellifer* p. 227.

b. Lower side of head smooth, except some spines at chin. . . . . 3. *D. infranudus* p. 228.

B. Head 1.24—1.6. Head less disk like (*Coelophrys*).

a. Origin of dorsal nearer tip of snout than tip of caudal 1). Second dorsal with 6 rays . 4. *D. mollis* p. 229.

b. Origin of dorsal midway between tip of snout and tip of caudal. Second dorsal with 5 rays . . . . 5. *D. oblongus* p. 230.

c. Origin of dorsal nearer tip of caudal than tip of snout.

a^1. Origin of dorsal nearer tip of caudal than posterior margin of eye.

a^2. Second dorsal with 7 rays. P. 16. Width of rostral cavity much more than diameter of eye . . . . . . 6. *D. brevicaudata* p. 230.

b^2. Second dorsal with 6 rays. P. 13. Width of rostral cavity equaling horizontal diameter of eye . . . . 7. *D. brevipes* p. 231.

b^1. Origin of dorsal nearer posterior margin of eye than tip of caudal . . . . . 8. *D. micropus* p. 232.

1. **Dibranchus nasutus** Alcock

Dibranchus nasutus Alcock, Ann. Mag. Nat. Hist. (6) VIII, 1891, p. 24. — Descr. Cat. Indian Deep-Sea Fishes, 1899, p. 63.

Dibranchus nasutus Brauer, Valdivia Exp. Tiefsee-Fische I, Syst. Teil, 1906, p. 328.

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1) See footnote at description of the species.

Dibranchus nasutus Radcliffe, Proc. U. S. Nat. Mus. XLII, 1912, Pl. 22, fig. 3, Pl. 23, fig. 3.
Dibranchus nasutus M. Weber, Siboga Exp. Fische, 1913, p. 568.

D¹. I. D². 4—6. A. 4. P. 13—15. V. 5.

Height 5.3—6.1, 5.9—7.7 in length with caudal. Head 1.7—1.8, 2.1—2.2 in length with caudal, 1.1—1.28 in its greatest breadth, which goes 1.4—1.5 in length of fish without caudal. Eye 6.9—7.3, about equal to snout and 1.9—2 in shortest breadth of interorbital space (the eyes converging anteriorly) in large specimens and equal to interorbital space in small ones. Mouth horizontal, somewhat arched. Maxillary reaching to below frontborder of eye. Rostrum well prominent above mouth. Opening of rostral cavity oval, longer than high. Illicium with two lateral, rounded bulbs and a median one which is more or less filamentous. Origin of dorsal about midway between tip of caudal and tip of snout, slightly behind gill opening, totally in advance of the anal. Dorsal and anal rays simple. Brachial part of pectorals shorter than rayed part, which is about equal in distance between outer borders of eyes. Ventrals as long as pectorals in small specimens, shorter than pectorals in larger ones. Caudal slightly rounded. Skin of upper parts covered with spines on stellate bases, those along edge of disk larger and often bifid. Two rows of large, slender spines along base of dorsal and anal, the upper row continued for a short distance on disk before dorsal. Spines on lower parts much smaller. Colour of preserved specimens dark brownish or yellowish. Length 145 mm.

Habitat: Makassar Straits, 724 mm!; Banda Sea, 1158 and 1886 m!; Timor Sea, 918 m. — East coast of Africa, Gulf of Aden, Tranvancore coast, Andaman Sea.

Note. The above description is made after the specimens of the Siboga Expedition. M. Weber l.c. says that he found in all his specimens 13 pectoral rays and 6 rays in the dorsal, except in one specimen, which had 5 rays. In the specimen from Macassar Straits, however, I cannot detect more than 4 dorsal rays and the specimen of St. 208, Banda Sea, has 15 pectoral rays.

2. **Dibranchus stellifer** Smith & Radcliffe

Dibranchus stellifer Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLII, 1912, p. 210.

D¹. I. D². 6. A. 4. P. 15. V. 5.

Head 1.82, its breadth 1.92 in length. Eye 5.58, 1.57 in interorbital space. Rostrum high, scarcely projecting beyond jaws. Illicium ending in two globular lobes and a narrow bifurcate lobe. Dorsal surface covered with stellate tubercles, those on anterior part of head and sides of body largest, each capped with a long, slender spine, those on sides of disk bifid, rostral spine and spines at angles of disk small, not much larger than those along sides of disk, those on ventral surface small, scattered. Insertion of dorsal midway between tip of rostrum and tip of caudal. Insertion of anal under or slightly behind posterior base of dorsal. Colour in alcohol: dusky olivaceous; caudal margined with blackish above and below, basal portion of median rays white, becoming sepia distally. Other fins brownish black. Length of single specimen known 90 mm (After Smith and Radcliffe, not seen by me).

Habitat: Flores Sea, 1245 m.

Note. The authors say that this species differs from *nasutus* "in having the disk narrower, much more elevated and heavier, and the framework much less cartilaginous". The breadth of the disk, however, is not a reliable character to distinguish between species of this genus. These fishes apparently are able, by movements of the opercular apparatus, to change the breadth of the head. Some of the specimens of *nasutus* mentioned above show a disk which much resembles that of *stelliger*, but by gentle pressing from above they assume the shape of typical *nasutus*, getting less deep at the same time.

3. **Dibranchus infranudus** n. s.p (Fig. 52, p. 225)

Dibranchus (*micropus*?) M. Weber, Siboga Exp. Fische, 1913, p. 369 (partim).

D^1. 1 D^2. 6. A. 4. P. 15. V. 5.

Height 5, 6.1 in length with caudal. Head 1.7, 2.1 in length with caudal, slightly more than its greatest breadth which goes 1.8 in length without caudal. Eye 6.2, equal to snout and 1.75 in slightly convex interorbital space. Mouth arched, slightly oblique; maxillary reaching to below frontborder of pupil. Rostrum scarcely prominent above mouth. Opening of rostral cavity triangular with a rounded top, the base formed by the upper jaw. The cavity is deep and the illicium is situated far back in it. Illicium with two small bulbs and a membraneous part overhanging the bulbs and provided at the sides(?) with thick worm like filaments. Origin of dorsal at equal distances from tip of snout and tip of caudal. Origin of anal below posterior dorsal rays. Rayed part of pectorals slightly more than distance between outer borders of eyes. Ventrals shorter than pectorals. Caudal long, truncate. Skin of upper parts covered by simple spines on stellated bases, some of those along edge of disk bifid, the two spines forming an angle of 180°. Lower side of head smooth, except some tiny spines on chin. Colour of preserved specimen yellowish. Length of single specimen 80 mm.

Habitat: Flores Sea, 521 m!

Note. This species has the spineless underside in common with *D. nudiventer* Lloyd and *D. simulus* Smith & Radcliffe. From the firstnamed it differs in that the gill openings are much nearer to the base of the caudal than to the tip of the snout, these distances being about equal in *nudiventer*. From *simulus* it differs by the different shape of the rostral cavity and by the position of the dorsal, the origin of which is midway between anterior margin of eye and tip of caudal in *simulus*. The exact construction of the illicium could not be ascertained, for fear of damaging the single specimen. Weber l.c. ranged this specimen with some doubt under *micropus*, but suggested that it might belong to *nudiventer*.

4. **Dibranchus mollis** (Sm. & Radcl.)

Coelophrys mollis Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLII, 1912, p. 212.

D^1. I. D^2. 6. A. 4. P. 15.

Head large, subcircular, 1.38, depth 2.1 in length. Eye 4.66, snout 3,5. Mouth large, nearly horizontal, jaws subequal. Interorbital 3, broad, depressed. Rostrum depressed, truncate. Tentacular cavity as wide as interorbital, low, and shallow. Illicium protractile, tipped with two lateral lobes and a broad, fleshy flap above. Tubercles small, closely packed, apical prickles elongate; those along edge of disk Y-shaped; tubercles on ventral side slightly smaller, apical prickles shorter. Insertion of dorsal nearer tip of snout than tip of caudal 1), rays very slender. Caudal 2.1, narrow. Base of anal not entirely behind base of dorsal, rays slender. Ventrals 5.23, very small. Pectorals 2.47, more than double the length of ventrals, tips reaching beyond base of caudal. Colour in alcohol: Cream white; edges of disk, margin of gill opening lower base of pectorals dusky black; ventrals blackish, tips whitish. Length of single specimen 39 mm. (After Smith & Radcliffe, not seen by me).

Habitat: Palawan Passage, 675 m.

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1) According to the figure the origin of the dorsal is nearer tip of caudal than tip of snout, and about midway between posterior margin of eye and tip of caudal.

5. **Dibranchus oblongus** (Sm. & Radcl.)

Coelophrys oblonga Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLII, 1912, p. 214.
Dibranchus (*micropus*?) M. Weber, Siboga Exp. Fische, 1913, p. 569 (partim).

D^1. I. D^2. 5. A. 4. P. 15. V. 5.

Head narrow, elongate, not disk like, wider than high, 1.5, 2.1 in length with caudal. Length of body exclusive of caudal 2.9. Eye 6.2, equal to snout. Interorbital 3.7, flat. Rostrum scarcely elevated. Tentacular cavity very small and shallow, trilobate tip of illicium entirely closing the triangular aperture. Lateral lobes of the illicium globular, the median one flattened and incised at its tip. Tubercles capped with a slender spine, many of them bifid. A median trifid spine above tentacular cavity. Spines on ventral surface much smaller than those on dorsal side. Origin of dorsal midway between tip of snout and tip of caudal. Origin of anal below last dorsal ray. Pectorals 1.8, reaching base of caudal. Ventrals 3.5, slightly less than three fifths of length of pectorals. Colour of preserved specimen greyish, pinkish where muscles shine through. Caudal black at tip, outer and lower rays also dark. Outer half of pectorals and ventrals smoky. Length of specimen described 40 mm.

Habitat: Banda Sea, 1158 m!; Gulf of Tomini, 1370 m.

Note. The description made after a specimen of the Siboga Expedition from St. 211, which Weber recorded as differing from the other specimens examined by him. I am not sure that it really belongs to *oblongus*. In the description I have followed the sequence of that of Smith and Radcliffe to make comparison easier. My specimen is less elongate and has apparently longer and less numerous spines, the rostrum is more elevated and has a strong spine. The description of Smith and Radcliffe is not clear everywhere, and is not always in accordance with the figure, for instance on the relative position of dorsal and anal.

6. **Dibranchus brevicaudatus** (Brauer)

Coelophrys brevicaudata Brauer, Valdivia Exp. Tiefsee—Fische. I. Syst. Teil, 1906, p. 331.

D^1. I. D^2. 7. A. 4. P. 16. V. 5.

Height 2.5, 3.2 in length with caudal. Head 1.3, 1.5 in length with caudal, its breadth 2.1 in its length and 2.8 in length with caudal. Eye 5.8, 2.1 in interorbital space. Snout about two thirds of eye. Mouth large, almost horizontal, reaching to below middle of eye. Rostral cavity very large, its width much more than diameter of eye, not protruding beyond mouth. Illicium large, the bulb consisting of three parts. Origin of dorsal nearer tip of caudal than posterior margin of eye. Origin of anal below posterior part of dorsal. Pectorals slightly less than interorbital space. Ventrals small, their length 3.5 in length of pectorals. Caudal short, slightly rounded. Skin covered with small prickles, the sensory canals and the lateral line broad and devoid of prickles. Prickles of lower side smaller than those of upper side. Colour in alcohol dark brown. Length of single specimen 66.5 mm. (After Brauer, not seen by me).

Habitat: N.W. of Sumatra, 1024 m.

7. **Dibranchus brevipes** (Sm. & Radcl.)

Coelophrys brevipes Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLII, 1912, p. 213.

D^1. I. D^2. 6. A. 4. P. 13. V. 5.

Head long, strongly arched, greatest breadth equaling the greatest depth, length 1.24, breath 1.8. Body very short, length exclusive of caudal 4.62. Eye 4.83, large, lateral. Snout 4.14, narrow. Mouth large, horizontal, jaws subequal. Maxillary 3.22. Interorbital 2.90, convex. Tentacular aperture large, nearly as high as long, its width equaling horizontal diameter of eye; cavity spacious, extending backward to posterior margin of eye. The trilobate tip of the illicium entirely closing tentacular aperture, the two lower lobes thick and fleshy, the upper thinner, membranous, with a series of short filaments along its outer edge. Skin soft, covered with small prickles. Insertion of dorsal nearer tip of caudal than posterior margin of eye. Anal small, its base nearly reaching base of caudal. Ventrals small, slightly more than one third length of pectorals. Pectorals 2—2.3. Colour in alcohol: Anterior half of head, body behind gill openings, vertical fins and pectorals cream colour; rest of head clove brown, darkest on ventral surface; basal half of ventrals brown, tips white; a slight brownish shade on anterior pectoral rays distally. Length 51 mm. (After Smith & Radcliffe, not seen by me).

Habitat: Gulf of Boni, Celebes, 918 m. — East coast of Mindanao, 684 m.

Note. "This species closely resembles *C. brevicaudata* Brauer, but differs in having the head much shorter and deeper" (Smith & Radcliffe).

8. **Dibranchus micropus** Alcock

Dibranchus micropus Alcock, Ann. Mag. Nat. Hist. (6) VIII, 1891, p. 25. — Descr. Cat. Indian Deep-Sea Fishes, 1899, p. 63.

Dibranchus micropus Brauer, Valdivia Exp. Tiefsee-Fische, I. Syst. Teil, 1906, p. 329.

Coelophrys micropus Radcliffe, Proc. U. S. Nat. Mus. XLII, 1912, Pl. 26, fig. 1, Pl. 27, fig. 1.

Dibranchus (*micropus*?) M. Weber, Siboga Exp. Fische, 1913, p. 569 (partim).

Dibranchus micropus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 287.

D^1. I. D^2. 6. A. 4. P. 15. V. 5.

Height 4—5.1, 5.3—6.4 in length with caudal. Head 1.5—1.6, 2—2.1 in length with caudal, 1.03—1.2 in its greatest breadth which goes 1.47—1.5 in length without caudal. Eye 6.6—7.7, equal to snout and 1.9—2 in slightly convex interorbital space. Mouth arched, slightly oblique; maxillaries reaching to below middle of eye. Rostrum scarcely prominent above mouth. Opening of rostral cavity lozenge shaped. Illicium with two lateral round bulbs and a short appendix between them. Origin of dorsal nearer to tip of caudal than to tip of snout, slightly behind gill opening. Origin of anal below posterior part of dorsal. Dorsal and anal rays simple. Brachial part of pectorals shorter than rayed part, which is longer than distance between outer borders of eyes, and goes 4.3—4.6 in total length. Ventrals two thirds or one half of pectorals. Caudal truncate. Skin of upper parts covered by single or bifid spines on stellated bases, those of lower side much smaller and scattered. Colour of preserved specimens light yellowish or pinkish. Length of specimens examined 69 and 96 mm.

Habitat: Flores Sea, 794 m!; Ceram Sea, 835 m! — East coast of Africa, Gulf of Aden, Bay of Bengal, Gulf of Manaar, Andaman Sea.

Note. The description is made after two of the four specimens from the Siboga Expedition, which Weber recorded with some doubt as *micropus*. One of the four which Weber thought possibly to belong to *D. nudiventer* is described above as a new species: *D. infranudus*. Another small specimen, from St. 211, probably belongs to *D. oblongus*, the other two are those described above as *micropus*. They differ in some points from Alcock's description, having 6 in stead of 5 dorsal rays (but Brauer also counts 6 rays), the disk is in one specimen slightly shorter than the tail, equal to tail in the other. The ventrals are much longer than those of Alcock's specimen, which are not a third the length of the pectorals. Alcock does not say anything about the striking lozenge shaped aperture of the rostral cavity. Hence I thought it better to base my description on the Siboga specimens only.

2. **Halieutaea** Valenciennes

(Valenciennes, in Cuvier & Valenciennes, Hist. Nat. Poissons XII, 1837, p. 455)

Disk subcircular. Mouth horizontal. Jaws with bands of minute, blunt teeth. No teeth on palate. Two gills and a half, the anterior branchial arch without filaments. Rostral cavity roofed by a bony bridge. Illicium with a short stalk and a trilobate end. Nostrils on snout, at side of rostral cavity. Skin covered with more or less developed prickles on stellated bases, those of lower side small or absent. Dorsal with 4—5 rays, on anterior part of body. Anal with 4 rays, partly or totally behind dorsal. Ventrals with 5 rays. Caudal truncate.

Distribution. Indic and Pacific. In moderate and great depths.

Key to the Indo-Australian species of Halieutaea

A. D. 4. Disk flat.
  a. Roof of rostral cavity not extending to the margin of the disk, hence its opening visible from above . . . . 1. *H. stellata* p. 233.
  b. Roof of rostral cavity extending forward as far as the edge of the disk, hence its opening not visible from above . . . . 2. *H. indica* p. 235.
B. D. 5. Disk distinctly convex in front . . . . . 3. *H. coccinea* p. 236.

1. **Halieutaea stellata** (Vahl) (Fig. 53, p. 234)

Lophius stellatus Vahl, Skr. Naturh. Kjöbenh. IV, 1797, p. 214.
Lophius faujas Lacepède, Hist. Nat. Poissons, 1798, p. 318.
Lophius muricatus Shaw, Gen. Zool. V. Part II, 1804, p. 382.
Halieutaea stellata Valenciennes, in Cuvier & Valenciennes, Hist. Nat. Poissons XII, 1837, p. 456.
Halieutaea stellata Temminck & Schlegel, Fauna Japonica, Pisces, Part 4, 1845, p. 160.
Halieutaea stellata Bleeker, Nat. Tijdschr. Ned Indië III, 1852, p. 279. — Verh. Akad. Amsterdam I. Bijdr. kennis ichth. fauna Japan, 1853, p. 10.
Halieutaea stellata Günther, Cat. Brit. Mus. III, 1861, p. 203.
Halieutaea stellata Alcock, Ann. Mag. Nat. Hist. (6) VI, 1890, p. 206.
Halieutaea stellata Jordan & Sindo, Proc. U. S. Nat. Mus. XXIV (1901) 1902, p. 380.

Halieutaea stellata Annandale & Jenkins, Mem. Indian Mus. III, No. 1, 1910, p. 19.
Halieutaea stellata Franz, Abh. K. Bayer. Akad. Wiss. Suppl. Bd. IV. 1. Abh. 1910, p. 89.
Halieutaca stellata vittata M. Weber, Siboga Exp. Fische, 1913, p. 566.
Halieutaea stellata Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 480.
Halicutaca stellata Herre, Hongkong Naturalist VI, 1935, p. 293.
Halicutaca stellata Kamohara, Ann. Zool. Japan 16, No. 1, 1937, p. 12.
Halicutaea stellata Fowler, Hongkong Naturalist. Suppl. 6, 1938, p. 52.

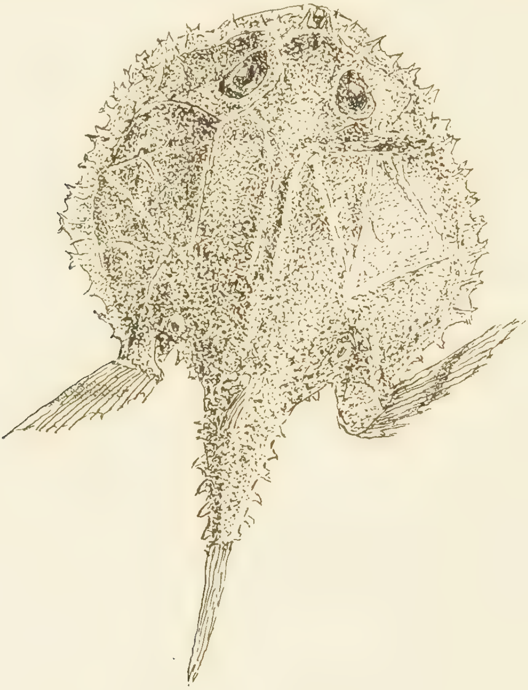

Fig. 53. *Halieutaea stellata* (Vahl) nat. size.

Halicutaea stellata Boeseman, Zool. Med. Rijksmuseum Leiden, 1947, p. 136.
Halicutaea stellata Herre, Philipp. Journ. Sci. 79, No. 2 (1950) 1951, p. 154.
Halieutaea stellata Munro, The marine and fresh water fishes of Ceylon, 1955, p. 284 (sine syn.).

D^1. I. D^2. 4. A. 4. P. 12—13. V. 5.

Height 4.95—6.88, 6.6—9 in length with caudal. Head 1.58—1.7, 2—2.3 in length with caudal. Greatest breadth of head 1.14—1.4 in length without caudal. Length of head 1.19—1.4 in its breadth. Eye 5—6.2, equal to or somewhat more than snout and equal to interorbital space in small specimens, 1—1.8 in large specimens. Interorbital space flat, but the inner orbital rims elevated and connected before the eyes by a bony ridge which forms the superior border of the aperture of the rostral cavity, the roof of which does not extend to the anterior margin of the disk, hence the opening of the rostral cavity is partly visible from above. End of illicium trilobate; a pair of fringed lobes inferiorly and a single median lobe superiorly, the three fitting in the triangular aperture of the rostral cavity. Mouth horizontal, somewhat arched, the maxillary reaching to below front-border of eye in small specimens, to below middle of eye in large specimens. Bands of very small, blunt teeth in the jaws. Dorsal rays short, about equal to eye. Origin of anal below posterior dorsal rays. Anal rays longer than dorsal ones. Brachial part of pectorals well developed, but shorter than rayed part, the longest pectoral rays about equal to distance between outer borders of eyes. Origin of ventrals at equal distances from symphysis of lower jaw and origin of anal or somewhat nearer to lastnamed, much shorter than pectorals. Skin of upper surface covered with prickles on stellated bases. Interorbital space and cheeks naked; anterior part of post-orbital part of head naked or with few spines in young specimens, with small spines in large specimens. Prickles bordering disk ending in two or more spines and provided with filaments in large specimens. Lower side smooth or with minute and scattered spines. Colour of preserved specimens pinkish. Upper side of head sometimes with irregular rows of dark spots, or in large specimens with light brown blotches and dark brown spots. Second dorsal more or less dusky. Anal and ventrals white or yellowish. Pectorals white with black tips or in young with a blackish transverse band. Length 240 mm.

Habitat: Bali Sea, 100 m!; N. coast of Sumbawa, 274 m!; Ceram; near W. coast of New Guinea, 95 m! — Trevandrum, Malabar coast, Bay of Bengal!, Ceylon, E. coast Malay peninsula, Philippines, China, southern Korea, Japan.

2. **Halieutaea indica** Ann. & Jenk.

Halieutaea stellata Day, Fishes of India, Part II, 1876, p. 273 (nec Vahl).
Halieutaea indica Annandale & Jenkins, Mem. Indian Mus. III, No. 1, 1910, p. 19.
Halieutaea stellata M. Weber, Siboga Exp. Fische, 1913, p. 566 (nec Vahl).

D^1. I. D^2. 4 (5). A. 4. P. 13. V. 5.

Height 5.3—5.8, 7—7.3 in length with caudal. Head 1.6—1.7, 2—2.2 in length with caudal. Greatest breadth of head 1.15—1.23

in length without caudal. Length of head 1.3—1.4 in its breadth. Eye 4.6—7.3, 1—1.18 in the interorbital space. Snout 1.4—1.8 in eye. Interorbital space flat but bordered by the elevated orbital rims which are connected before eyes by a bony ridge, which forms the superior border of the rostral cavity, the roof of which extends to the anterior margin of the disk; hence the aperture of the rostral cavity is invisible from above. End of illicium trilobate; a pair of fringed lobes inferiorly and a single median lobe superiorly. Mouth horizontal, somewhat arched. Maxillary reaching to below middle of eye. Bands of very small, blunt teeth in the jaws. Dorsal rays short, equal to distance between posterior borders of eyes. Origin of anal below posterior half of dorsal. Longest anal rays slightly longer than longest dorsal rays. Brachial part of pectorals shorter than rayed part. Longest pectoral rays about equal to distance between outer borders of eyes. Origin of ventrals at about equal distances from symphysis of lower jaw and origin of anal. Skin of upper surface densely covered with prickles on stellated bases. Interorbital space and cheeks naked. Prickles of edge of disk ending in two or more spines. Lower surface with scattered groups of microscopical spines. Colour of preserved specimens brown or yellowish and pinkish above, with irregular dark, more or less reticulated lines. Lower side light, the groups of spines showing as very small white spots. Length 110 mm.

Habitat: Sapeh Straits, 69 m!; near west coast of New Guinea, 95 m!; near Timor, 216 m! — Bay of Bengal!

3. **Halieutaea coccinea** Alc.

Halieutaea coccinea Alcock, Ann. Mag. Nat. Hist. (6) IV, 1889, p. 382. — Descr. Cat. Indian Deep-Sea Fishes, 1899, p. 61.
Halieutaea nigra M. Weber, Siboga Exp. Fische, 1913, p. 566 (nec Alcock?).
Halieutaea coccinea M. Weber, ibid. p. 567.
Halieutaea coccinea Norman, Sci. Rep. Murray Exp. Br. Mus. VII, No. 1, 1939, p. 113.

D^1. I. D^2. 5. A. 4. P. 13—15. V. 5.

Greatest height slightly behind eye, 5—5.8, 6.15—7.1 in length with caudal. Head 1.5—1.7, 2—2.1 in length with caudal. Eye 5.7—8.1, more than snout in small specimens, somewhat less than snout in a very large specimen, 1.09—2.1 in interorbital space, which is flat or slightly concave, bordered by the low orbital rims, which are connected before eyes by a bony bridge forming the upper and side borders of the opening of the rostral cavity, the roof of which does not extend to anterior end of disk. Hence the opening of the rostral cavity is partly visible from above. End of illicium trilobate, viz. a pair of fringed lower lobes and a single upper lobe. Mouth large, arched; maxillary reaching to below hindmargin of eye. Bands of small, blunt, teeth in the jaws. Longest dorsal rays equal to eye in small specimens, longer than eye in a large specimen. Origin of anal slightly behind end of dorsal, its longest rays longer than those of dorsal. Rayed part of pectorals equal to distance between outer borders of eyes. Origin of ventrals about at equal distances from symphysis of lower jaw and origin of anal. Ventrals much shorter than pectorals. Caudal truncate. Skin of upper parts covered by smaller and larger stellated prickles, more scattered in young specimens; those of edge of disk bifid. Lower side with small prickles, less developed in young than in adults. In a large specimen well developed filaments along disk, specially in neighbourhood of mouth. Colour of preserved specimens light brown or whitish. Length 330 mm.

Habitat: Macassar Straits, 450 m!; Flores Sea, 644 m! — Andaman Sea!, Maldive area.

Note. I see no difference between the specimens described as *H. nigra* Alcock by M. Weber, l.c., and a paratype of *H. coccinea* of about the same length. In his original description Alcock says: "It is possible, though hardly probable, that this may be an immature form of *Halieutaea coccinea,* mihi". Judging from the description there is not much to distinguish between *coccinea* and *nigra,* but Annandale and Jenkins in their "Key to the Indian species of Halieutaea" (Mem. Ind. Mus. III, No. 1, 1910, p. 18) separate the two as follows: *H. nigra,* disk flat. *H. coccinea,* disk distinctly convex in front.

3. **Malthopsis** Alcock

(Alcock, Ann. Mag. Nat. Hist. (6) VIII, 1891, p. 26)

Disk triangular, snout produced into a sharp point. Mouth small, horizontal. Jaws, vomer and palatines with minute teeth. Two gills. Rostral cavity narrow. Nostrils on sides of rostral cavity. Skin covered with larger and smaller cone-shaped, ridged tubercles or dermal ossicles, scattered or in regular rows on lower side of head. Dorsal with 4—7 rays. Anal with 2—4 rays. Ventrals with 5 rays. Caudal truncate or rounded.

Distribution: Deeper parts of Indic and West Pacific, westwards to coast of East Africa, eastwards to Hawaii.

1. **Malthopsis lutea** Alcock (Fig. 54, p. 238)

Malthopsis luteus Alcock, Ann. Mag. Nat. Hist. (6) VIII, 1891, p. 26.
Malthopsis lutea Alcock, Descr. Cat. Indian Deep-Sea Fishes, 1899, p. 64.
Malthopsis luteus Brauer, Valdivia Exp. Tiefsee-Fische, 1906, p. 326.
Malthopsis lutea Radcliffe, Proc. U. S. Nat. Mus. XLII, 1912, Pl. 18, fig. 2, Pl. 19, fig. 2.
Malthopsis lutea M. Weber, Siboga Exp. Fische, 1913, p. 565.
Malthopsis lutea Kamohara, Ann. Zool. Japan. 16, No. 1, 1937, p. 13.

D^1. I. D^2. 5. A. 4. P. 11. V. 5.

Height 4.64—5.18, 5.71—6.13 in length with caudal. Head 1.83—1.86, 2.2—2.26 in length with caudal. Breadth of head 1.54—1.96 in length without caudal. Eye 4.1—4.6. Snout 1.4—1.6 in eye.

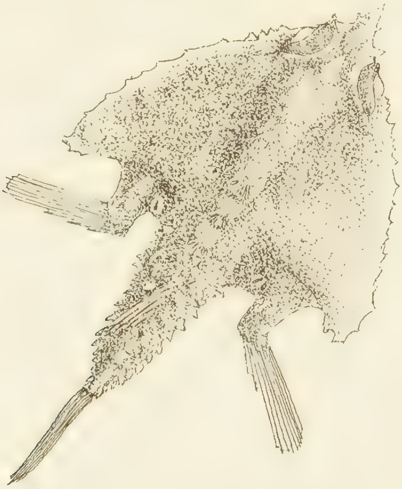

Fig. 54. *Malthopsis lutea* Alcock. nat. size.

Slightly concave interorbital space 1.6—1.88 in eye. Rostral cavity with a triangular opening, the base of which is less than the height, the latter equal to pupil. Illicium with a single round bulb. Mouth small, somewhat less than eye. Origin of dorsal at equal distances from tip of caudal and posterior or anterior border of eye. Origin of anal well behind base of dorsal. Brachial part of pectorals shorter than rayed part, the length of which is about equal to distance between outer borders of eyes. Base of ventrals at equal distances of symphysis of lower jaw and anus or slightly nearer to the latter, their length equal to that of rayed part of pectorals. Caudal slightly rounded. Colour of the two specimens described: The larger one (80 mm) light pinkish, the smaller one (68 mm) darker and with six dark rings or ocelli on the upper part of the head. Length 140 mm.

Habitat: Arafura Sea, 204 and 301 m! — West coast of Africa, 338—700 m, Andaman Sea, 360—729 m, Korea, Japan.

Note. Lloyd (Mem. Indian Mus. II, No. 3, 1909, p. 171) has given an account of the variability of this species, based on specimens dredged in the Andaman Sea. He distinguishes between 5 types, characterized by the breadth of the head, narrow, medium or broad, by the dermal ossicles which can be "orderly" or "disorderly" arranged on the ventral side and by the shape of the subopercular spine. From the two Siboga specimens described above, the smaller one belongs to type "v" ("disorderly" and "narrow" breadth 51 % of length without caudal, which is the type of *M. lutea* as described by Alcock) and the larger one to type "y" ("disorderly" and "medium" breadth 64 % of length without caudal).

I should have added to the synonymy of *M. lutea*: *Malthopsis ocellata* Smith & Radcliffe (Proc. U. S. Nat. Mus. XLII, 1912, p. 207) from the Philippines but for the fact that the anal is said to have only 2 rays.

4. **Halicmetus** Alcock

(Alcock, Ann. Mag. Nat. Hist. (6) VIII, 1891, p. 27)

Disk elliptical, rounded anteriorly, its greatest breadth posteriorly. Mouth horizontal, small. Jaws, vomer and palatines with villiform teeth. Two gills. Rostral cavity roofed by a bony ridge. Illicium trilobate, the inferior lobes sometimes united. Nostrils on snout, in front of rostral cavity. Skin of upper and lower side covered by minute prickles, like shagreen. Multifid spines along edge of disk, the last, subopercular spine, being larger than the others, on upper border of opening of rostral cavity and in few longitudinal rows along body and tail. Dorsal either absent, or with 1,2 or 3 rudimentary rays. Anal with 3—4 rays, its origin behind base of dorsal. Ventrals with 5 rays. Caudal truncate.

Distribution: Indic and S. W. Pacific.

1. **Halicmetus reticulatus** Smith & Radcliffe (Fig. 55, p. 240)

Halicmetus ruber Brauer, Valdivia Exp. Tiefsee-Fische, 1. Syst. Teil. 1906, p. 327. (partim?).
Halicmetus reticulatus Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. LXII, 1912, p. 208.
Halicmetus ruber var. *marmorata* M. Weber, Siboga Exp. Fische, 1913, p. 567.

D^1. I. D^2. 1—3. A. 4. P. 12. V. 5.

Height 6.37—6.7, 7.75—8.2 in length with caudal, and 3.5—4.1 in length of head. Head 1.88—1.9, 2.3 in length with caudal, 1.3—1.39 in breadth of head, which goes 1.39—1.44 in length without caudal. Eye 6.5—7, about equal to convex interorbital space. Snout 1.3—1.4 in eye. Mouth small, its length more than eye. Roof of rostral cavity projecting somewhat anteriorly before its floor. Illicium with the two inferior lobes fused into one, the superior one with two short filaments. Origin of dorsal much nearer tip of caudal than tip of snout, at about equal distances of tip of caudal and hindmargin of eye. Origin of anal behind that of dorsal. Longest pectoral rays about equal to distance between anus and origin of anal. Ventrals shorter than pectorals, their origin at equal distance of tip of snout and of anus. Colour of preserved specimens light yellowish or pinkish. Upper side of disk marmorated with light brown. Length of specimens described 34—62 mm.

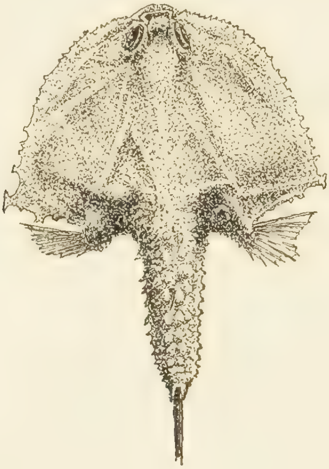

Fig. 55. *Halicmetus reticulatus* Smith & Radcliffe. nat. size.

Habitat: Near W. coast of Sumatra, 614 m?; Madura Sea, 289 m! — Philippines, 286—360 m, Japan.

Note. Alcock (Ann. Mag. Nat. Hist. (6) VIII, 1891, p. 27, pl. VIII, figs 1, 1a—b; Descr. Cat. Indian Deep-Sea Fishes, 1899, p. 66, Ill. Zool. Investigator pl. XIX, fig. 5) described *Halicmetus ruber* from the Andaman Sea as having no dorsal fin, A. 3—4, P. 11 and, according to the figures the breadth of the disk 1.68—1.7

in the length of the fish without caudal. Smith and Radcliffe (l.c.) say of *H. reticulatus* that it is easily distinguished from *H. ruber* by the broader disk, the breadth of which goes 1.33 in length without caudal. Moreover they find a small dorsal of 3 rays in three specimens, and A. 4, P. 12. In the specimens described by M. Weber (l.c.) as *H. ruber* var. *marmorata* I find that the breadth of the disk goes 1.39—1.44 in the length without caudal. In all 5 specimens a dorsal is present, in 3 specimens of 3 rays, in one of 2 rays and in one specimen of 1 ray only, and A. 4, P. 12. The colour of the disk, which in *H. ruber* is uniform light pink in life, is described in preserved specimens of *reticulatus* as pale olive with a reddish wash, reticulating lines white, whereas in *ruber* var. *marmorata* I find about the same pattern of colouring, only the reticulating lines are wider. Hence I do not hesitate to unite the var. *marmorata* with *reticulatus*. Another question is if *reticulatus* has to be united with *ruber*, for Brauer (l.c.) describes specimens, which he refers to *ruber*, as having D. 0—3, A. 3—4, P. 10—11. Now Brauer's specimens of the Valdivia Expedition came from the W. coast of Sumatra and from the coast of East Africa and it is possible that the former are *reticulatus* and the latter *ruber*, in which case the supposition of M. Weber would get strength, viz. that *marmorata* is an eastern variety of *ruber*. If so, *reticulatus*, could best be considered as a subspecies of *ruber*.

6. Family MELANOCETIDAE

Six branchiostegals. Hyomandibular with double head. Pelvic bones much expanded posteriorly. Four pectoral radials. Dorsal of 12—17 rays, placed posteriorly. Anal of 4 rays. Caudal with 8—9 well developed rays, 5 or 6 of which are forked. Males (as far as known) not parasitic.

Key to the Indo-Australian genera of Melanocetidae[1])

a. An illicium. Skin naked. Mouth very oblique, teeth strong. Nostrils small, on a tubular papilla (females) . . . . 1. *Melanocetus* p. 242.
b. No illicium. Skin spinulose or naked. No teeth but denticles on snout biting against those in front of lower jaw. Nostrils on an inflated prominence (males) . . . . 2. *Xenoceratias* p. 244.

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1) After Regan & Trewavas.

1. **Melanocetus** Günther

(Günther, Proc. Zool. Soc. London 1864, p. 301)

Skin naked. Illicium present. Mouth large, oblique. Jaws with long or moderately long depressible fangs. Nostrils small on a tubular papilla.

Distribution: Deep Sea of Atlantic, Indic and Pacific.

Key to the Indo-Australian species of Melanocetus

A. Interorbital width $^2/_5$ to $^4/_7$ postorbital width of
  head. D. 12—14. P. 15—18 . . . . 1. *M. murrayi* p. 242.
B. Interorbital width $^3/_5$ to $^4/_5$ postorbital width of
  head. D. 13—15. P. 17—21.
  a. Distal end of bulb of illicium conical, pigmented . . . . 2. *M. johnsoni* p. 243.
  b. Distal end of bulb with a tapering appendage, black except at tip . . . . 3. *M. cirrifer* p. 243.

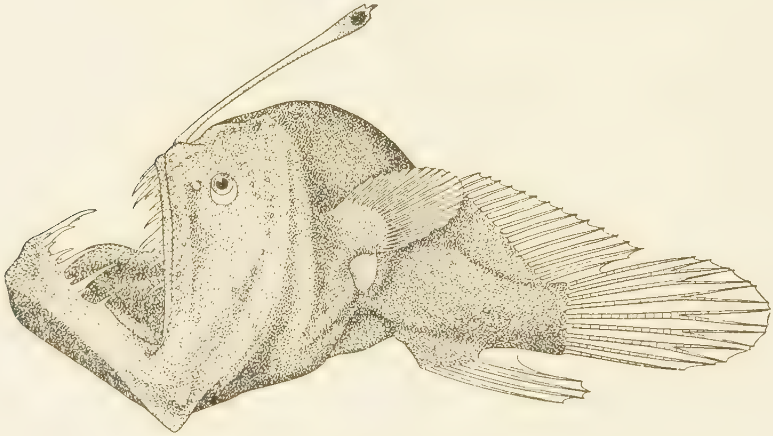

Fig. 56. *Melanocetus cirrifer* Regan & Trewavas (after Regan & Trewavas).

1. **Melanocetus murrayi** Günther

Melanocetus Murrayi Günther, Rep. Sci. Res. Challenger Exp. Zool. XXII, 1887, p. 57.
Liocetus murrayi Goode & Bean, Ocean. Ichthyol. 1896, p. 495.
Melanocerus vorax Brauer, Zool. Anz. 25, 1902, p. 294. — Valdivia Exp. Tiefsee-Fische I, 1906, p. 320.
Melanocetus Johnsoni Brauer, ibid. p. 318 (nec Günther).
Melanocetus Murrayi Regan, Dana-Rep. 1920—1922, Rep. 2, 1926, p. 32.

Melanocetus Murrayi Regan & Trewavas, Dana-Rep. 1928—1930. Rep. 2, 1932, p. 49.
Melanocetus murrayi Fowler, Mem. B. P. Bishop Mus. XII. 2. 1949, p. 158.

D^1. I. D^2. 12—14. A. 4. P. 15-18.

Vomerine dentition variable: a complete series of rather small teeth, or 3—4 teeth, irregularly spaced, or no teeth on vomer. Interorbital width $^2/_5$ to $^4/_7$ postorbital width of head. Illicium $^1/_4$ to $^1/_3$ length of fish; bulb oval, sometimes with small posterior crest; distal part usually unpigmented. Lower jaw $^2/_5$ to $^1/_2$ length of fish, with some long fangs, the longest more than half interorbital width in adults. Dorsal confluent with caudal. Length 110 mm. (Compiled, not seen by me).

Habitat: Banda Sea, 5000 m wire out. — Pacific, Atlantic, Caribbean Sea.

2. **Melanocetus johnsoni** Gthr

Melanocetus Johnsoni Günther, Proc. Zool. Soc. London 1864, p. 301. — Challener Exp. Zool. XXII, 1887, p. 57.
Melanocetus Johnsonii Goode & Bean, Ocean. Ichthyol. 1896, p. 494.
Melanocetus johnsoni Regan & Trewavas, Dana-Rep. 1928—1930. Rep. 2, 1932, p. 50.
Melanocetus johnsoni Fowler, Mem. B. P. Bishop Mus. XII. 2. 1949, p. 158.

D^1. I. D^2. 13—15. A. 4. P. 17—21.

Vomer with teeth. Interorbital width $^3/_5$ to $^4/_5$ postorbital width of head. Illicium up to $^3/_5$ length of fish; bulb rounded or oval, distally with a translucent cone, pigmented at the end, and posteriorly with a more or less definite pigmented crest, which may be absent in small specimens; a smaller anterior crest sometimes present. Lower jaw $^1/_2$ to $^2/_3$ length of fish, with some long fangs. Dorsal free from caudal. Length 114 mm. (Compiled, not seen by me).

Habitat: Celebes Sea, 3000 m of wire out. — Indic, Pacific and Atlantic.

3. **Melanocetus cirrifer** Regan & Trewavas (Fig. 56)

Melanocetus cirrifer Regan & Trewavas, Dana-Rep. 1928—1930. Rep. 2. 1932, p. 52.

D^1. I. D^2. 15. A. 4. P. 19.

Six teeth on vomer. Interorbital width $^2/_3$ postorbital width of head. Illicium more than $^1/_2$ length of fish; bulb oval, with a stout tapering distal appendage, which is pigmented except at tip. Lower jaw more than $^1/_2$ length of fish, longest fangs $^2/_3$ interorbital width. Length 39 mm. (Compiled, not seen by me).

Habitat: Banda Sea, 4000 m of wire out; Celebes Sea, 3000 m of wire out. —? China Sea, 3000 m of wire out.

2. **Xenoceratias** Regan & Trewavas

(Regan & Trewavas, Dana-Rep. 1928—1930. Rep. 2. 1932, p. 54)

No illicium. Form more or less elongate. Skin spinulose or naked; a median series of enlarged spinules generally present on snout. Mouth toothless, a double series of curved denticles in front of upper jaw biting against similar denticles, more or less distinctly arranged in 3 groups, in front of lower jaw. Nostrils lateral, in an area of unpigmented skin which is inflated to form a prominence on each side of the snout. Eyes not directed forwards.

Key to the Indo-Australian species of Xenoceratias

a. Posterior nostril not contiguous to eye, snout
more than $^1/_3$ distance from its tip to gill opening 1. *X. longirostris* p. 244.
b. Posterior nostril contiguous to eye. Snout about
$^1/_4$ distance from its tip to gill opening . . . 2. *X. brevirostris* p. 245.

1. **Xenoceratias longirostris** Regan & Trewavas

Xenoceratias longirostris Regan & Trewavas, Dana-Rep. 1928—1930. Rep. 2. 1932, p. 54.

Xenoceratias longirostris Fowler, Mem. B. P. Bishop Mus. XII. 2. 1949, p. 159.

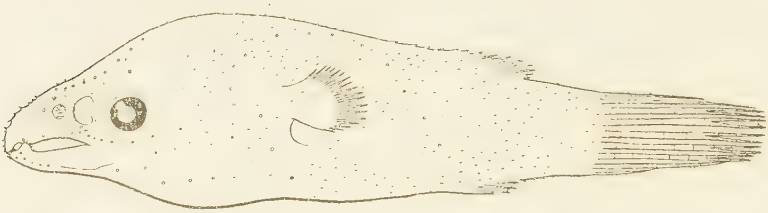

Fig. 57. *Xenoceratias longirostris* Regan & Trewavas (after Regan & Trewavas).

D. 14. A. 4. P. 18. C. 9 (2 + 5 + 2).

Depth of body nearly 3. Snout rather long, more than $^1/_3$ distance from its tip to gill opening. Upper profile decurved; a median series of 10 enlarged spinules on anterior part of snout; 8 denticles at end of rostrum, rather small, in 2 series. Lower jaw with 3 prominences, each bearing 5 or 6 denticles; median prominence opposed to rostral denticles; lateral prominences erect, outside anterior ends of premaxillaries. Maxillary nearly reaching vertical from anterior edge of eye. Posterior nostril well separated from eye, its vertical diameter nearly equal to that of eye, nearly three times that of anterior nostril; 15 olfactory lamellae. Anterior 5 dorsal rays rudimentary. Caudal nearly $^2/_5$ length of first. Spinules of skin well developed, particularly on posterior half of fish. Length 29 mm. (Compiled, not seen by me).

Habitat: North of New Guinea, 3000 m of wire out.

2. **Xenoceratias brevirostris** Regan & Trewavas

Xenoceratias brevirostris Regan & Trewavas, Dana-Rep. 1928—1930. Rep. 2. 1932, p. 57.

D. 13. A. 4. P. 20. C. 9 (2 + 5 + 2).

Depth of body $2^3/_4$. Snout short, obliquely truncated, about $^1/_4$ distance from its tip to gill opening; 2 or 3 median spinules on anterior edge of snout; 9 denticules at end of rostrum rather strong, with ends pointed and recurved. Lower jaw with a median group of about 7 denticles, barely separated from two lateral groups of 5. Maxillary reaching vertical from anterior edge of eye. Posterior nostril close to and nearly as large as eye, its vertical diameter $1^1/_2$ that of anterior nostril; 15 olfactory lamillae. Caudal a little less than $^1/_3$ total length. Skin with scattered spinules. Length 27 mm. (After Regan & Trewavas, not seen by me).

Habitat: Celebes Sea, 3000 m of wire out.

7. Family DICERATIIDAE

Six branchiostegals. Hyomandibular with double head. Pelvic bones expanded posteriorly. Three pectoral radials. Dorsal of six rays, posterior in position. Anal of 4 rays. Caudal with 9 well developed rays, 4 to 6 forked. Males probably not parasitic.

Three genera known, one in the Indo-Australian Archipelago.

1. **Diceratias** Günther

(Günther, Rep. Challenger Exp. Zool. XXII, 1887, p. 53)

Aeschynichthys Ogilby, Proc. Royal Soc. Queensland XX, 1906, p. 25.

Illicium on snout. Skin spinulose.

1. **Diceratias bispinosus** Gthr

Ceratias (*Diceratias*) *bispinosus* Günther, Rep. Challenger Exp. Zool. XXII, 1887, p. 53.

Ceratias (*Diceratias*) *bispinosus* Alcock, Descr. Cat. Indian Deep-Sea Fishes, 1899, p. 56.

Diceratias bispinosus Regan, Dana-Rep. 1920—1922. Rep. 2. 1926, p. 42.

Diceratias bispinosus Regan & Trewavas, Dana-Rep. 1928—1930. Rep. 2. 1932, p. 58.

D^1. II. D^2. 6. A. 4. P. 14—15. C. 9.

Height, when the stomac is empty, about half total length. Head much larger than body and tail combined. Sphenotic spine well developed, pointing upwards. Illicium about one third length of fish and nearly ten times as long as the ray behind it; bulb with a few filaments. Mouth enormous. A series of shorter and longer fang like depressible teeth in the jaws. Vomer with a few slender, long teeth. Soft dorsal and anal close to caudal, both with simple rays. Six median rays of caudal forked. Length 140 mm. (Compiled, not seen by me).

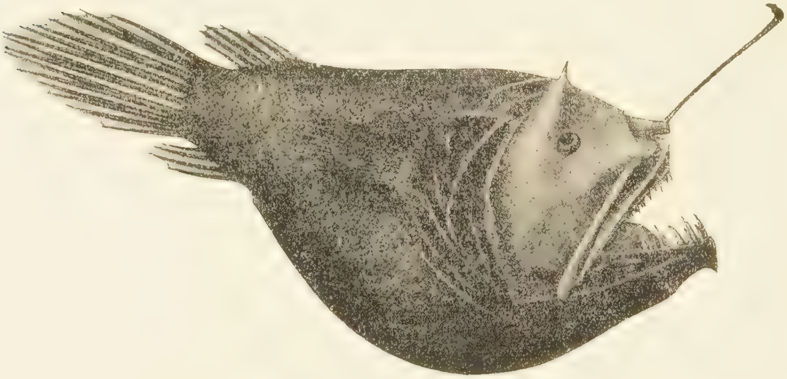

Fig. 58. *Diceratias bispinosus* Gthr. After Alcock.

Habitat: Banda Sea. — Arabian Sea.

8. Family ONEIRODIDAE

Six branchiostegals. Hyomandibular with double head. Pelvic bones present, and more or less expanded posteriorly. Three pectoral radials, the third broadest. Dorsal and anal fins of 4 to 8 rays, posterior in position. Caudal with 8 or 9 well developed rays, 4 of which are usually forked. Males not parasitic.

Key to the Indo-Australian genera of Oneirodidae

I. An illicium. Nostrils small, on a tubular papilla. Teeth in jaws well developed (females).

  A. Jaws equal anteriorly, or lower a little projecting.
    1. Sphenotic spines sharp; skin naked.
      a. Illicium on snout. No isolated ray on back . . . . 1. *Dolopichthys* p. 247.
      b. Illicium arising between sphenotic spines or further back . . . . . 2. *Lophodolus* p. 253.
    2. Sphenotic spines small, skin spinulose 3. *Centrophryne* p. 253.
  B. Premaxillaries extending forward beyond lower jaw, attached to head by a wide membrane. Two very long teeth with hooked ends on each side of upper jaw 4. *Thaumatichthys* p. 254.

II. No illicium; nostrils not raised, the anterior not widely separated from each other, and opening forwards; teeth vestigial or absent, but denticles in front of jaws (males) . . 5. *Trematorhynchus* p. 255.

1. **Dolopichthys** Garman

(Garman, Mem. Mus. Harvard XXIV, 1899, p. 81)

Skin smooth, naked. Illicium on snout; no isolated ray on the back. Pectoral rays 12 to 23, inserted at the end of a relatively short and broad lobe; radials nearly equal in length, all three extending to end of lobe. Sphenotic spines present. Jaws equal anteriorly; mouth moderate or large, teeth acute, unequal.

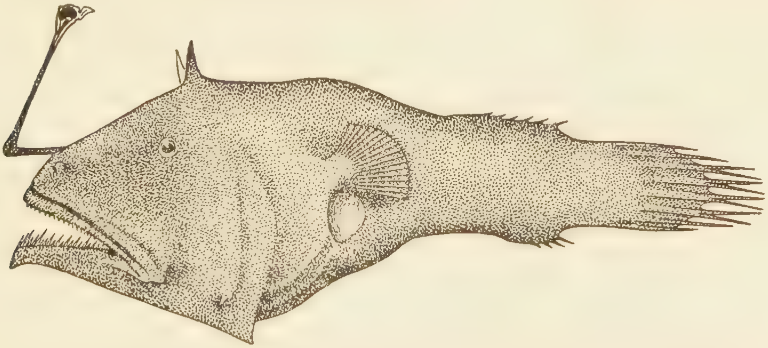

Fig. 59. *Dolopichthys pullatus* Regan & Trewavas (after Regan & Trewavas).

Key to the Indo-Australian species of Dolopichthys

A. Snout relatively short, and clift of mouth extending to behind eye.

- 1. Caudal fin uncovered by black skin, except at base. Bulb of illicium much shorter than stem (*Dermatias*).
  - a. Bulb of illicium with a large compressed anterior appendage, and with several paired minute distal filaments . . . . 1. *D. cristatus* p. 249.
  - b. Bulb of illicium with a small leaf like anterior appendage, or none; distal filaments finger shaped, much shorter than bulb . . . . 2. *D. digitatus* p. 249.
  - c. Bulb of illicium with an anterior digitiform appendage, with branches on edges and some paired lateral branches, and a posterior filament as long as the oval bulb . . . . . 3. *D. multifilis* p. 249.
  - d. Bulb of illicium with an anterior peduncle bearing 3 or 4 short branched filaments, and a posterior filament as long as bulb . . . . 4. *D. thysanophorus* p. 250.
  - e. Bulb of illicium with a very long and much branched anterior appendage.
    - a¹. Main branches blackish distally; ultimate divisions ending in translucent swellings . . . . 5. *D. mirus* p. 250.
    - b¹. Branches unpigmented, ultimate divisions tapering . . . . 6. *D. schmidti* p. 251.
- 2. Caudal fin covered with black skin to some distance from its base. Bulb of illicium about as long as stem, with fleshy posterior appendage about 1/2 as wide as bulb which has a truncated distal papilla. No other appendages or filaments (*Microlophichthys*) . . . . 7. *D. exiguus* p. 251.

B. Snout relatively long, and cleft of mouth not extending beyond eye. Caudal fin covered with black skin to some distance from its base (*Dolopichthys*). Some teeth on vomer. Bulb containing a bean shaped glandular organ and with a large posterior appendage . . . . 8. *D. pullatus* p. 252.

Incertae sedis . . . . 9. *D. colletti* p. 252.

1. **Dolopichthys cristatus** Regan & Trewavas

Dolopichthys cristatus Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 67.

D^1. I. D^2. 6. A. 4—5. P. 12—14.

Basal bone short. Illicium $^1/_4$ to $^1/_3$ length of fish. Bulb and distal part of stem unpigmented; bulb with a terminal papilla, and behind it a short compressed appendage with a posterior branch and sometimes a lateral pair; in front of base of papilla on each side a small lobe bearing 5 to 7 filaments; a large anterior appendage, compressed, with frilled edge or frilled end. Lower jaw more than $^2/_5$ length of fish; teeth $\frac{10 - 21}{13 - 23}$ on each side; 2 or 3 teeth on each side of vomer. Length 215 mm. (After Regan & Trewavas, not seen by me).

Habitat: Banda Sea, 4000—6000 m of wire out; N. of Celebes, 5000 m of wire out.

2. **Dolopichthys digitatus** Regan & Trewavas

Dolopichthys digitatus Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 68.

D^1. I. D^2. 6. A. 4. P. 15-16.

Illicium nearly $^1/_3$ length of fish, 3 times length of exserted part of basal bone. Stem and basal half of bulb pigmented; bulb with an oval pigmented body; a distal backwardly directed truncated papilla, with distal pigment streak and a pair of black patches in front of its base; a short and rather stout posterior filament; an anterior leaf like appendage; near middle line two paired groups of stout filaments, some united at base. Lower jaw $^1/_2$ length of fish. Articular spines strong. On each side about 15 teeth in upper jaw, 18 in lower, 3 on each side of vomer. Length 32 mm. (After Regan & Trewavas, not seen by me).

Habitat: N. of New Guinea, 4000 m of wire out.

3. **Dolopichthys multifilis** Regan & Trewavas

Dolopichthys multifilis Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 73.

D^1. I. D^2. 6. A. 4. P. 14.

Illicium, to end of bulb, a little longer than exserted part of basal bone, $^2/_7$ length of fish. Stem and basal half of bulb black; bulb containing an oval pigmented organ; a truncated papilla with distal pigment streak, and at its base a black saddle from which a median strip runs forward; posterior filament about as long as bulb; an anterior digitiform appendage, half as long as bulb, proximally with pigmented axis, and bearing two pairs of lateral branches, distally forming two compressed expansions, with a pair of branches between them; above and behind this appendage, on each side of middle line, two simple filaments and three branched ones close together. Lower jaw $^1/_2$ length of fish. On each side about 12 teeth in upper jaw and 15 in lower jaw; 2 on each side of vomer. Length 26 mm. (After Regan & Trewavas, not seen by me).

Habitat: Sulu Sea, with 1000 m wire out.

4. **Dolopichthys thysanophorus** Regan & Trewavas

Dolopichthys thysanophorus Regan & Trewavas, Dana-Rep. 1928—1920. Rep. 2. 1932, p. 74.

D^1. I. D^2. 5-6. A. 4. P. 14-16.

Illicium, to end of bulb, about $^1/_5$ length of fish, more than twice as long as exserted part of basal bone. Stem and basal half of bulb pigmented; bulb nearly as long as stem, containing an oval pigmented organ; a truncated terminal papilla, with distal pigment spot, and a pair of black patches in front of its base; a posterior filament as long as bulb; anterior appendage with 3 branched filaments on a short peduncle. Lower jaw $^1/_2$ length of fish, or nearly. On each side of jaws about 20 teeth (in larger specimen), or about half as many (in the smaller); 2 to 4 on each side of vomer. Length of 2 specimens known 26 and 17 mm. (After Regan & Trewavas, not seen by me).

Habitat: Sulu Sea, with 3500 m of wire out.

5. **Dolopichthys mirus** Regan & Trewavas

Dolopichthys mirus Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 74.

D^1. I. D^2. 6. A. 4. P. 15-16.

Illicium, to end of bulb, $^2/_3$ length of exserted basal bone, which is $^1/_2$ length of fish. Stem pigmented; bulb elongate, proximally pigmented; a terminal papilla with distal pigmented spot; a posterior tentacle, compressed, with a pair of short branches; a distal series of 3 bifid filaments on each side; anteriorly a pair of much longer unpigmented branched filaments, one on each side of a stout median appendage, which gives off a short posterior branch and then divides into two tapering filaments $^1/_2$ as long as the fish, each with several filamentous branches; proximal part of each main filament, and proximal branches, translucent with pigmented axis, distal part and branches pigmented, with colourless slightly swollen ends. Lower jaw nearly $^1/_2$ length of fish. Articular spines well developed. On each side about 15 teeth in upper jaw, and about 20 in lower; 2 or 3 teeth on each side of vomer. Length 59 mm. (After Regan & Trewavas, not seen by me).

Habitat: Indian Ocean, off Sumatra, with 3000 m wire out.

6. **Dolopichthys schmidti** Regan & Trewavas

Dolopichthys schmidti Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 75.

D^1. I. D^2. 6. A. 4. P. 15.

Illicium, to end of bulb, $^3/_4$ length of exserted basal bone, which is $^1/_2$ length of fish; stem pigmented, bulb oval, pigmented except distally; a terminal papilla; a very small posterior tentacle; on each side 4 or 5 stout filaments, bearing minute branches, arise from a common base; anteriorly a broad transverse flap, bearing a median branched filament and a lateral pair, and on each side of the median filament a filament as long as the fish, which divides 2 or 3 times, and may bear a slender branch at the first division. Lower jaw $^1/_2$ length of fish. On each side about 20 teeth in upper jaw and 30 in lower; 3 teeth on each side of vomer. Length 46 mm. (After Regan & Trewavas, not seen by me).

Habitat: Banda Sea, with 5000 m of wire out.

7. **Dolopichthys exiguus** Regan & Trewavas

Dolopichthys exiguus Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 78.

D^1. I. D^2. 5. A. 5. P. 16-17.

Illicium $^1/_9$ length of fish; pigment on base of bulb; posterior appendage broad, rhomboidal; a truncated papilla in middle of distal end of bulb, well separated from appendage; terminal expansion of pigment streak on anterior surface of bulb. Lower jaw $^2/_5$ length of fish; teeth $\frac{18}{18}$ on each side. Length 22 mm. (After Regan & Trewavas, not seen by me).

Habitat: North of New Guinea, 4000 m of wire out. — S. China Sea, 2000 m of wire out, Indian Ocean, 3000 m of wire out.

Note. As in the specimens from N. of New Guinea and that from the S. China Sea the illicium was damaged, it is not sure that they belong to *D. exiguus.*

8. **Dolopichthys pullatus** Regan & Trewavas (Fig. 59, p. 247)

Dolopichthys pullatus Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 79.

D^1. I. D^2. 6. A. 4. P. 18-19.

Illicium twice as long as exserted part of basal bone, and 4½ in length of fish; distal half of stem, and bulb, unpigmented; bulb containing a bean shaped glandular organ, with long axis antero-posterior, pigmented, with distal white stripe produced into a papilla at each end; a posterior leaf like appendage, translucent with opaque core, and with a pair of small wings near its anterior edge. Lower jaw $2^2/_3$ in length of fish; teeth $\frac{36}{40}$ on each side; 2 teeth on each side of vomer. Length 42 mm. (After Regan & Trewavas, not seen by me).

Habitat: Moluccas, with 500 m of wire out.

9. **Dolopichthys colletti** (M. Weber)

Linophryne Colletti M. Weber, Siboga Exp. Fische, 1913, p. 559.

D^1. ? D^2. 6. A. 4. P. 16. C. 9. Br. 6.

Head about 2.25 in length. A short, blunt spine at symphysis of lower jaw. An erected pointed sphenotic spine, a longer quadratic spine and a shorter articular spine. About 12 teeth of unequal length in the upper jaw and 14 teeth in the lower jaw which is $^2/_5$ of length of the fish (without caudal). Pectorals pointed. Three pectoral radials. Length about 90 mm.

Habitat: Bali Sea, 1018 m.!

Note. As mentioned by Weber l.c., the single specimen was much mutilated when taken out of the net. The skin and part of the tissues of the head had gone, and there was no trace of an illicium. Regan & Trewavas (Dana Rep. 1928-1930, Rep. 2, 1932, p. 57, footnote) say of this species: "propably a *Diceratiid*". The presence of well developed mandibular, sphenotic, quadratic, and articular spines, make it almost sure that the specimen belongs to *Dolopichthys.* I could not find any trace of pelvic bones, but probably they have been present. The absence of an illicium makes it impossible to identify the specimen with any species known, but probably it belongs to the subgenus *Dermatias,* and it may be related to *D. digitatus.*

2. **Lophodolus** Lloyd

(Lloyd, Mem. Indian Museum II, No. 3, 1909, p. 167)

Skin smooth, naked. Illicium far back, its basal bone emerging between or behind sphenotic spines. Lower jaw with acute symphysial spine and slender, pointed spines at the posterior angle. Teeth rather numerous.

1. **Lophodolus acanthognatus** Regan (Fig. 60, p. 253)

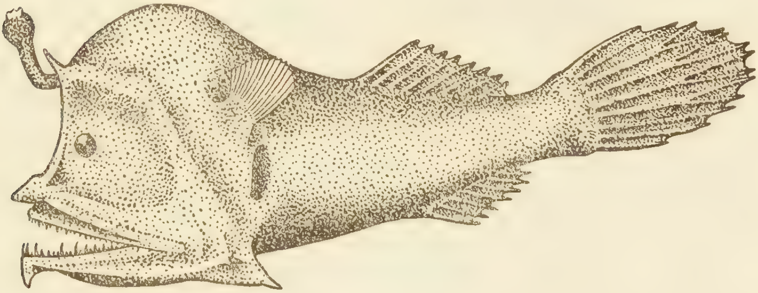

Fig. 60. *Lophodolus acanthognathus* Regan. After Regan.

Lophodolus acanthognathus Regan, Ann. Mag. Nat. Hist. (9) XV, 1925, p. 563. — Dana-Rep. 1920-1922. Rep. 2. 1926, p. 30.
Lophodolus acanthognathus Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 83.

D^1. 1. D^2. 5-8. A. 4-7. P. 17-19.

Snout short. Mouth very oblique. Lower jaw about $^2/_5$ length of fish. Basal bone of illicium emerging between or behind sphenotic spines, its exserted part as long as or shorter than illicium, which is $6^1/_2$ or $8^1/_2$ in length of fish. Bulb rounded, with a pair of filaments. Quadrate spine slender, pointed, longer than the mandibular. Length 52 mm. (After Regan & Trewavas, not seen by me).

Habitat: N.W. of Borneo, 3000 m of wire out; Celebes Sea, 2000 m of wire out. — Atlantic.

3. **Centrophryne** Regan & Trewavas

(Regan & Trewavas, Dana Rep. 1928-1930. Rep. 2. 1932, p. 84)

Near *Dolopichthys* (*Dermatias*), but skin spinulose, and mouth rather small, the maxillary ending below eye. A symphysial spine. Articular spines minute or absent.

1. **Centrophryne spinulosa** Regan & Trewavas (Fig. 61, p. 254)

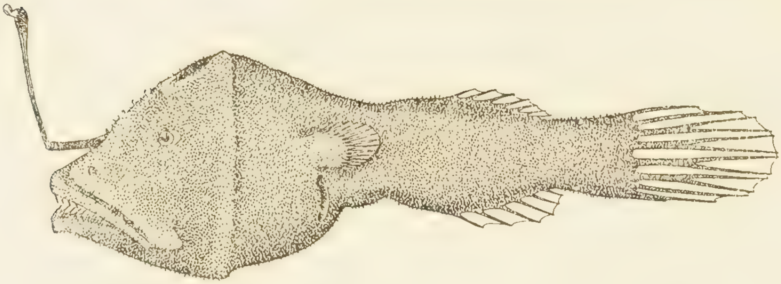

Fig. 61. *Centrophryne spinulosa* Regan & Trewavas (after Regan & Trewavas).

Centrophryne spinulosa Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 84.

Centrophryne spinulosa Fowler, Mem. B. P. Bishop Mus. XII. 2. 1949, p. 159.

D^1. I. D^2. 6-7. A. 6. P. 16.

Illicium nearly 3 times as long as exserted part of basal bone, $^2/_9$ to $^1/_4$ length of fish; stem pigmented; bulb elongate, compressed, broadest distally, covered with a network of fine black lines except at end, and bearing two distal appendages, the anterior large, compressed and fan shaped, the posterior a papilla or short tentacle. Sphenotic spines blunt, not piercing skin. Lower jaw less than $^1/_3$ length of fish. On each side 17 to 22 teeth in upper jaw, 21 to 24 in lower; 4 or 5 on each side of vomer. Length 51 mm. (After Regan & Trewavas, not seen by me).

Habitat: North of New Guinea, 4000 m of wire out. — Gulf of Panama, 4000 m of wire out.

4. **Thaumatichthys** Smith & Radcliffe

(Smith & Radcliffe, Proc. U.S. Nat. Mus. XLII, 1912, p. 579)

Lower part of body and head covered with spiniferous tubercles. Premaxillaries extending forward beyond lower jaw, attached to head by a wide membrane, widely separated at tip, leaving a broad edentulate concavity. Small eye near angle of very large mouth. Long, depressible, unequal curved or hooked teeth in each jaw; a pair of long, hinged, hooked teeth on each side of upper jaw near the tip of the premaxillary. Illicium extending from frontals nearly to tip of snout, dilating into a small bulb, the latter is surrounded by a tooth bearing pedicel.

1. **Thaumatichthys pagidostomus** Smith & Radcliffe

(Fig. 62, p. 255)

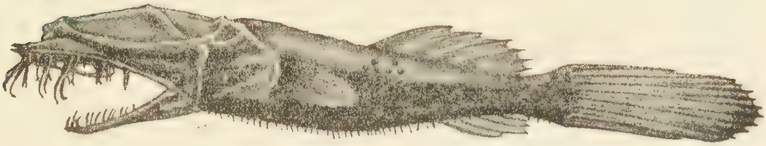

Fig. 62. *Thaumatichthys pagidostomus* Smith & Radcliffe. After the authors.

Thaumatichthys pagidostomus Smith & Radcliffe, Proc. U.S. Nat. Mus. XLII, 1912, p. 580.
Thaumatichthys pagidostomus Regan, Dana-Rep. 1920-1922. Rep. 2. 1926, p. 31.

D^1. I. D^2. 6. A. 4. P. 15. C. 8.

Head large, 2.06 in total length of fish. Eye minute, 20 in head, 11.3 in snout. Mouth horizontal, cavernous. A pair of long, hinged, hook like teeth, the largest 2.35 in premaxillary, inserted near inner process of premaxillary and lying closely applied to roof of mouth, these teeth capable of being swung forward laterally like cranes so as to close toothless space in front of jaw. A small patch of small teeth on either side of roof of mouth posteriorly. Illicium lying in skin on top of head and extending nearly to margin of upper jaw, where it terminates in a bulbous process about size of eye; this bulb projects through roof of mouth into the oral cavity and appears to be a luminous organ, and from it there extends downward into the mouth a slender pedicel bearing at its tip a sharp tooth-like process that curves backward. It would appear that the cavernous, elastic mouth is a trap into which the food is lured and dispatched. The light from the bulb in the roof of the mouth shines through the toothless space in the front of the upper jaw and attracts the prey which, having entered the mouth, is prevented from escaping and brought within reach of the lateral teeth by the two pairs of large, hinged, hooked teeth. Length of single specimen known 84 mm. (After Smith & Radcliffe, not seen by me).

Habitat: Celebes (Gulf of Tomini) at a depth of 1370 m.

5. **Trematorhynchus** Regan & Trewavas

(Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 91)

No illicium. Skin naked. Snout short, decurved. Nostrils not raised, the anterior opening forwards near end of snout. Teeth in jaws vestigial or absent. A transverse series of denticles at end of snout biting against one or two similar series in front of lower jaw, below which are some on chin.

1. **Trematorhynchus leucorhinus** (Regan) (Fig. 63, p. 256)

Rhynchoceratias leucorhinus Regan, Ann. Mag. Nat. Hist. (9) XV, 1925, p. 566. — Dana-Rep. 1920-1922. Rep. 2. 1926, p. 44.
Trematorhynchus leucorhinus Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 91.

D^1. 0. D^2. 4-7. A. 4-6. P. 15-18. (C. 9 (2 + 4 + 3).

Nostrils large, the anterior close together, the posterior contiguous to eye; nasal area white. Rostral denticles not projecting forwards. Depth about $3^1/_2$ in length. Length 23 mm. (Compiled, not seen by me).

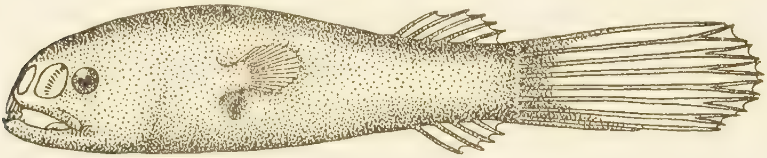

Fig. 63. *Trematorhynchus leucorhinus* (Regan). After Regan.

Habitat: N.W. of Borneo, 3000 m of wire out; Sulu Sea, 3500 m of wire out. — S. of Ceylon, Gulf of Panama, Atlantic.

9. Family CERATIIDAE

Six branchiostegals. Hyomandibular with double head. Pelvic bones slender, not expanded. Four pectoral radials. Dorsal and anal of 3 to 5 rays, posterior in position. Caudal with 8 well developed rays, 4 of which are forked. Females with mouth vertical, or subvertical, teeth moderate, in 2 or more series, inner longest, and illicium on a long exserted basal bone that emerges between the orbits. On the back one or more isolated rays, in last cases in the form of tentacles, papillae or caruncles. Free swimming males of this family have not been recognized. Parasitic males are known of the genus *Ceratias*.

Key to the Indo-Australian genera of Ceratiidae

a. Illicium with a very short stem, the bulb attached almost directly to end of basal bone, 4 rays on the back in the form of caruncles, two median and two lateral ones	1. *Cryptosparas* p. 257.
b. Illicium with a fairly long, slender stem, 3 rays on the back in the form of caruncles, one median, 2 lateral	2. *Mancalias* p. 258.

1. **Cryptosparas** Gill

(Gill, "Forest and Stream", 1883, p. 284)

Paraceratias Tanaka, Journ. Coll. Sci. Tokyo XXIII, 1908, p. 18.

Skin with minute, close set spinules. Illicium with a short stem, the bulb attached almost directly to end of basal bone. On the back, in front of soft dorsal, four rays, each carrying a gland with a pore, the first median, and either concealed, papilliform, or tentacle-like, the other three in the form of a larger median and two smaller lateral sessile oval caruncles. Six species known.

1. **Cryptosparas couesi** Gill (Fig. 64, p. 257)

Cryptosparas couesii Gill, "Forest and Stream", 1883, p. 284.
Cryptosparas couesii Goode & Bean, Oceanic Ichthyol. 1896, p. 491.

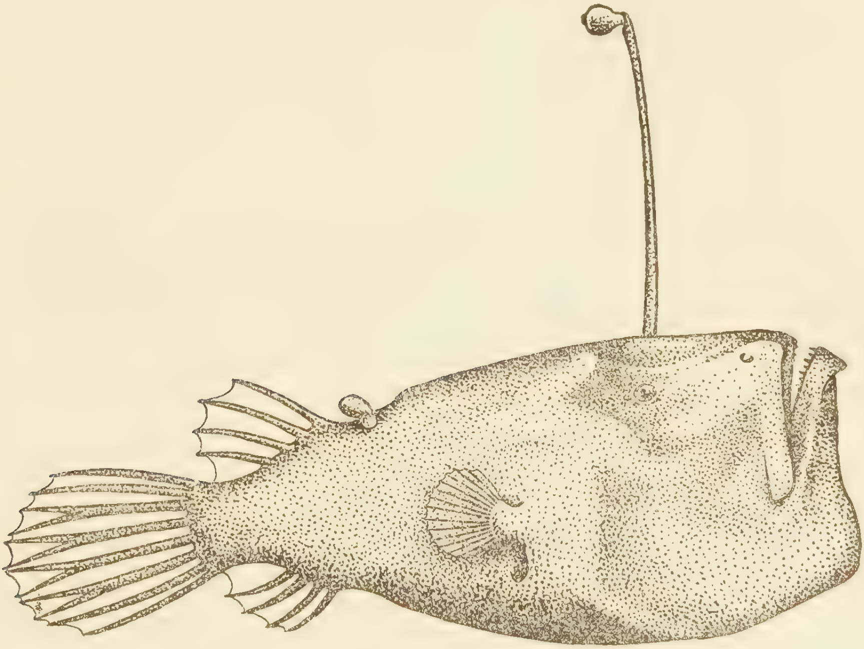

Fig. 64. *Cryptosparas couesi* Gill. After Regan.

Cryptosparas couesii Regan, Dana-Rep. 1920-1922. Rep. 2. 1926, p. 35.
Cryptosparas couesii Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 96.

D1. I + IV. D2. 4. A. 4. P. 16-17.

Basal bone of illicium from less than $1/2$ to about $5/9$ length of fish. Bulb of illicium pigmented at base and on sides, leaving dorsal and ventral areas that broaden out distally; a distal pair of black ridges, from between which arises a filament, often long and usually branched. Length 300 mm. (Compiled, not seen by me).

Habitat: Off Sumatra, 2500 m of wire out; S. of Bali, 300 m of wire out. — Atlantic, Indic and Pacific.

2. **Mancalias** Gill

(Gill, Proc. U. S. Nat. Mus. I, 1878, p. 227)

Typhlosparas Gill, "Forest and Stream", 1883, p. 284.
Myosparas Gilbert, Bull. U. S. Fish. Comm. (1903) 1905, p. 694.

Skin with minute close set spicules. Illicium with fairly long, slender stem. On the back, in front of soft dorsal, three rays, each carrying a gland with a pore, the first median, and either concealed, palilliform, or tentacle-like, the others a pair of stalked caruncles. Four species known.

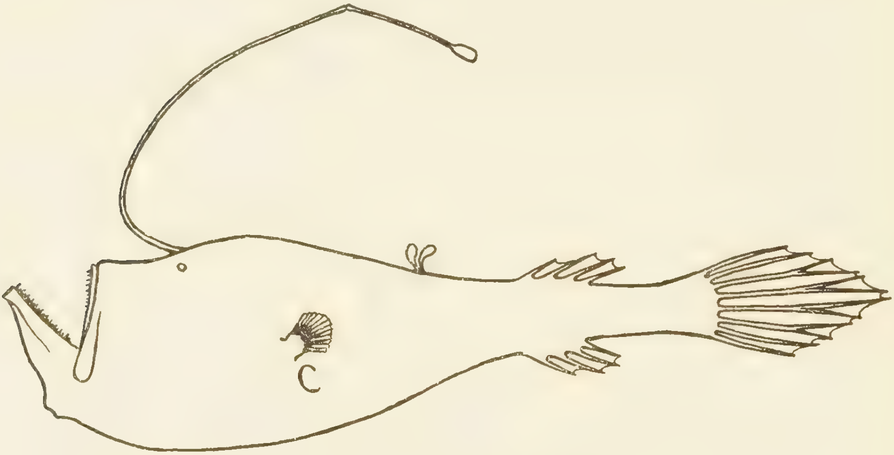

Fig. 65. *Mancalias uranoscopus* (Murray). After Regan and Goode & Bean.

1. **Mancalias uranoscopus** (Murray)

Ceratias uranoscopus Murray, in Thomson's Voyage of the Challenger, 1878, II, p. 76.
Mancalias uranoscopus Gill, "Forest and Stream", 1883, p. 284.
Typhlosparas Schufeldti Gill, l.c.
Ceratias uranoscopus Günther, Challenger Exp. Zool. XXII, 1887, p. 54.
Ceratias Shufeldti Günther, l.c.
Mancalias uranoscopus Goode & Bean, Oceanic Ichthyol. 1896, p. 490.
Mancalias shufeldtii Goode & Bean, l.c.
Myosparas myops Gilbert, Bull. U. S. Fish. Comm. (1903) 1905, p. 694.

Mancalias uranoscopus Regan, Dana-Rep. 1920-1922. Rep. 2. 1926, p. 37.
Mancalias uranoscopus Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2, 1932, p. 99.

D^1. I + III. D^2. 3-5. A. 4-5. P. 17-18.

Depth about 3 in length. Basal bone of illicium from less than $^1/_2$ to $^2/_3$ length of fish; illicium $^2/_9$ to $^1/_3$ length of fish; bulb ovate, sharply differentiated from stem, without filaments, pale, sometimes with terminal pigment spot. A low median prominence, rarely forming a distinct papilla, in front of caruncles. Length 114 mm. (Compiled, not seen by me).

Habitat: Off Sumatra, 700 m of wire out; N. of Moluccas, 800 m of wire out. — Indic, Pacific, and Atlantic.

10. Family LINOPHRYNIDAE

Five branchiostegals. Hyomandibular with a single head. No pelvic bones. Preoperculum strongly curved, or angular. Maxillaries very slender. Three pectoral radials, the second broadest. Dorsal and anal short, posterior, of 2 to 4 rays. Males parasitic.

Key to the Indo-Australian genera of Linophrynidae

a. An illicium. No rostral denticles (females). A hyoid barbel; a preopercular spine. Skin black, teeth few and strong	1. *Linaphryne* p. 259.
b. No illicium. Rostral denticles present, united to a median bone that extends upwards. Jaws toothless or with 1 or 2 teeth	2. *Aceratias* p. 260.

1. **Linophryne** Collett

(Collett, Proc. Zool. Soc. London 1886, p. 138)

Skin black. Sphenotic spines strong; a strong pointed spine at angle of preopercle. Mouth large. Teeth strong. A hyoid barbel. Illicium on snout. D^2. 2-3. A. 2-3. C. 8-9 (2 + 4 + 2-3). Fourteen species known.

1. **Linophryne corymbifera** Regan & Trewavas (Fig. 66, p. 260)

Linophryne corymbifera Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 110.

D^1. I D^2. 2. A. 2. P. 15.

Illicium, to end of bulb, about $^1/_9$ length of fish to base of caudal, with stout black stem about as long as the large oval bulb, which is pigmented except at distal end and has translucent distal appendages, namely, a median papilla bearing three short filaments, a pair of long fringed filaments in front of it, a long simple median filament behind it, and two long simple filaments on each side. Hyoid barbel, excluding terminal filaments, about $^1/_7$ length of fish; stem black for a little more than $^2/_3$ of its length, distally translucent, and dividing into two branches, the posterior simple, the anterior again dividing, this being repeated until there are 6 branches ending at the same level, each with a terminal swelling bearing a filament; 3 or 4 tubercles proximal to swelling on longer branches; filament of longest branch long, with several sessile or stalked tubercles. Length of lower jaw $2^1/_4$ in that of fish. Length of single specimen known 48 mm. (After Regan & Trewavas, not seen by me).

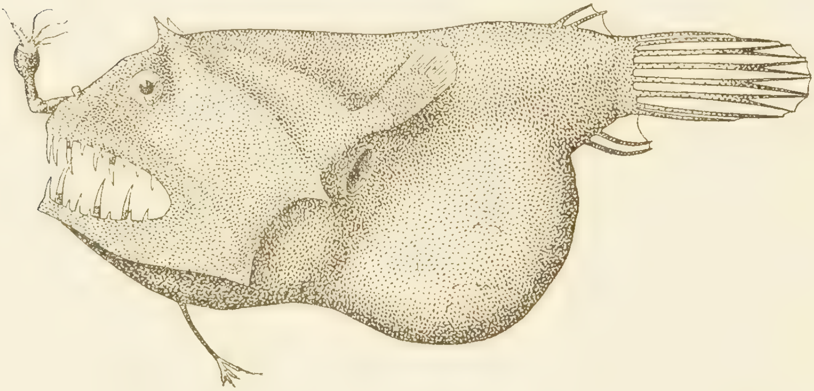

Fig. 66. *Linophryne corymbifera* Regan & Trewavas. After the authors.

Habitat: Celebes Sea, 1000 m of wire out.

2. **Aceratias** Brauer

(Brauer, Zool. Anz. XXV, 1902, p. 296. — Valdivia Exp. Tiefsee-Fische I, 1906, p. 323)

No illicium. Premaxillaries unossified, except for a pair of median plates. Jaws toothless, or with one or two small fixed teeth on each side. Three to five divergent rostral denticles, united basally to form a triangular bony plate; denticles in front of lower jaw on a predentary bone. Nostrils on a white prominence. Eyes generally directed forwards. Skin pigmented, inflated. D^2. 2-3. A. 2-3. P. 14-17. C. 8-9 (2-3 + 3-4 + 2-3). Two species known.

Key to the Indo-Australian species of Aceratias

a. No distinct sphenotic spines. D. 2-3. A. 2-3 1. *A. indicus* p. 261.
b. Prominent outwardly directed sphenotic spines.
D. 2. A. 2 . . . . 2. *A. macrorhinus* p. 261.

1. **Aceratias indicus** Brauer

Aceratias macrorhinus indicus Brauer, Zool. Anz. 1902. p. 296. — Valdivia Exp. Tiefsee-Fische, 1906, p. 325.
Aceratias indicus Regan, Dana-Rep. 1920-1922. Rep. 2. 1926, p. 45.
Aceratias indicus Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 113.

D. 2-3. A. 2-3. P. 16.

No distinct sphenotic spines. Three to five rostral denticles; in front of lower jaw a median antrorse denticle, and 4 to 6 erect recurved denticles on each side. Length 24 mm. (Compiled, not seen by me).

Habitat: Banda Sea, 4000 m of wire out. — Indic, Pacific, and Alantic.

2. **Aceratias macrorhinus** Brauer (Fig. 67, p. 261)

Aceratias macrorhinus Brauer, Zool. Anz. XXV, 1902, p. 296. — Valdivia Exp. Tiefsee-Fische, 1906, p. 324.
Aceratias macrorhinus Regan, Dana-Rep. 1920-1922. Rep. 2. 1926, p. 45.
Aceratias edentula Beebe, Bull. N. York Zool. Soc. XIII (4) 1932, p. 102.
Aceratias macrorhinus Regan & Trewavas, Dana-Rep. 1928-1930. Rep. 2. 1932, p. 113.

D. 2. A. 2. P. 16.

Depth 3.8. Head 2.1. Snout 5 in head. Eye 6.6, twice in interorbital space. Mouth reaching to anterior edge of eye. Three rostral denticles; in front of lower jaw either an erect median denticle, or none, and 4 erect recurved denticles on each side. Vomer edentulous. Prominent outwardly directed sphenotic spine. Length 30 mm. (Compiled, not seen by me).

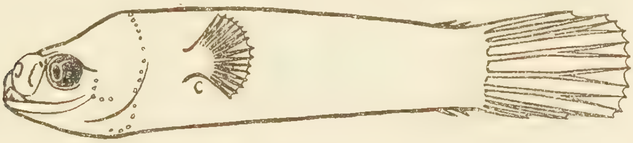

Fig. 67. *Aceratias macrorhinus* Brauer, After Regan and Brauer.

Habitat: Banda Sea, 3000 m of wire out. — Indic, Pacific, and Atlantic.

Order PLECTOGNATHI

Airbladder, if present, without open duct. Supraoccipital separating the parietals. Mouth small. Maxillary and premaxillary often firmly united. No ribs. Pelvic bones, if present, more or less completely co-ossified. Ventral fins, if present, thoracic and reduced to spines, occasionally with a single soft ray. Pectoral arch suspended from the skull. Either two dorsals, the first spinous, the second soft, and belonging to the caudal portion of the vertebral column, or the first dorsal absent or reduced to a thread-like filament. Anal more or less opposite to second dorsal. Gill opening narrow, in front of pectorals. Skin covered by scales, or bony plates, or spinules, or partly or totally naked.

Key to the Indo-Australian families of Plectognathi

1. Teeth not coalesced. A spinous dorsal generally present. Pelvis generally present. Ventrals present or absent. Supraclavicle vertical. Pectoral arch of the Perciform type. All the vertebrae with a single neural spine (*Sclerodermi*).
   a. Body covered with hard or spinous scales. Pelvis present. Spinous dorsal present.
      a^1. Ventrals paired, each of a long spine and occasionally with a small soft ray.
         a^2. Caudal peduncle short, not tapering. D^1. II-VI. D^2. 12-17. A. 11-15. . . 1. *Triacanthodidae* p. 263.
         b^2. Caudal peduncle tapering towards base of caudal. D^1. V. D^2. 20-25. A. 15-20 . . . . 2. *Triacanthidae* p. 269.
      b^1. Ventrals absent or united to a single short spine.
         a^2. Scales moderate or small, in regular series, imbricate. All soft fins with branched rays . . . . 3. *Balistidae* p. 278.
         b^2. Scales small or minute, not in regular
         with simple rays . . . . 4. *Monacanthidae* p. 312.
         series, rarely in contact. D, A, and P
      pelvis and ventrals absent . . . . 5. *Ostraciontidae* p. 345.
   b. Body encased in a carapace. Spinous dorsal,
2. Teeth coalesced, forming a beak with the jaws. The upper jaw with a median suture, the lower jaw without suture, A long pelvis supporting a large, compressed, pendant sac. Spinous dorsal rudimentary or absent. No ventrals (*Triodontina*) . . . . 6. *Triodontidae* p. 361.
3. Teeth coalesced, forming a beak with the jaws. Both jaws with a median suture or both jaws

without suture. No spinous dorsal. Pelvis and ventrals absent. Supraclavicle oblique or nearly horizontal. Lower three pterygials enlarged and immovably united to the coraco-scapular cartilage. Anterior vertebrae with bifid divergent neural spines (*Gymnodontes*).
a. Both jaws with a median suture. Caudal pre-
a^1. Caudal present, body inflatable . . . . 7. *Tetraodontidae* p. 363.
b. Jaws without median suture.
sent. Body inflatable . . . . 8. *Diodontidae* p. 410.
b^1. Caudal absent or almost so. Dorsal and anal confluent. Body not inflatable. . . 9. *Molidae* p. 416.

1. Family TRIACANTHODIDAE

Compressed, covered with scales which do not overlap. Caudal peduncle short, not much tapering towards base of caudal, which is rounded. Hind part of cranial roof formed by exoccipitals, frontals meeting premaxillary pedicels when the mouth is closed. First dorsal with II-VI spines, second dorsal with 12-17 rays. Anal with 11-15 rays. Ventrals consisting of a long spine and occasionally with a small soft ray. Premaxillaries protractile and free from maxillaries. Teeth in the jaws separate, not coalesced, in a single series, absent in upper jaw in one genus.

Distribution: Deep Sea fishes of Atlantic, Indic, and Pacific.

Key to the Indo-Australian genera of Triacanthodidae

I. First dorsal with six spines, the last two or three sometimes minute and inconspicuous. Snout not much prolonged.
  A. Mouth terminal. Lips moderate or thin. Interorbital space convex, orbital ridges not prominent. Lateral line inconspicuous. Form short and deep, depth of body 2-2.3 in length without caudal . . 1. *Paratriacanthodes* p. 264.
  B. Mouth dorsal. Lips thick. Depth of body 3-3.25 in length without caudal.
    a. Lateral line conspicuous, each pore with a coronet of denticles. Gill openings restricted, not reaching down to horizontal through lower border of eye . . . . 2. *Tydemania* p. 265.
    b. Lateral line inconspicuous. Gill openings relatively wide, extending downwards beyond horizontal through lower border of eye . . . . 3. *Atrophacanthus*, p. 266.

II. Dorsal spines 2 or 3. Snout much produced, tube like. Mouth dorsal. Lateral line inconspicuous . . . . 4. *Halimochirurgus* p. 268.

1. **Paratriacanthodes** Fowler

(Fowler, Proc. Acad. Nat. Sci. Philadelphia 85, 1934, p. 362)

Form short and deep, depth 2-2.3 in length without caudal. Mouth terminal, snout not produced. First dorsal with VI spines, the last deeply imbedded. Second dorsal with 15 rays. Anal with 13 rays. Pectorals short, rounded. Dorsal and ventral spines with or without strong retrorse barbs. A single, small, soft ray in the axil of the ventral spine. Lateral line inconspicuous.

Distribution: Three species known from the China Sea and the Banda Sea.

1. **Paratriacanthodes myersi** Fraser-Brunner

Triacanthodes anomalus Günther, Rep. Shore Fishes, Challenger Exp. 1880, p. 50 and Deep Sea Fishes, 1887, p. 266 (nec Schlegel).

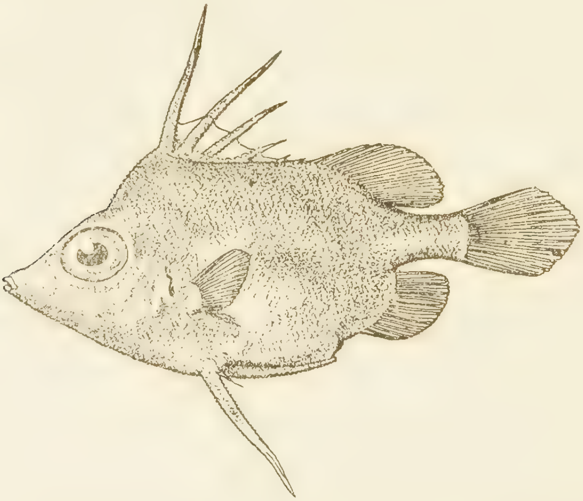

Fig. 68. *Paratriacanthodes myersi* Fraser-Brunner. After Fraser-Brunner.

Paratriacanthodes myersi Fraser-Brunner, Ann. Mag. Nat. Hist. (11) VII, 1941, p. 426.

D^1. VI. D^2. 15. A. 13. P. 15. V. I. 1.

Height 2. Head 3. Eye 2.5. Interorbital space two thirds diameter of eye. Distance from base of first dorsal spine to nearest point on orbit contained 1.5 times in length of head. Width of gill opening half diameter of eye. Length of caudal peduncle half length of head.

Last dorsal spines deeply imbedded, the membranes without scales. Basal two thirds of anterior dorsal spines with small asperities, somewhat enlarged as regular series on lateral edges; the ends of the spines naked and grooved longitudinally. Anal commencing at the vertical from middle of soft dorsal. Ventral spines with asperities on basal two thirds and grooved at distal ends, like the first dorsal spine; a single small soft ray in the axil of each. Dermal face of pelvis moderately broad, its greatest width contained 4.5 times in its length, which measures 1.125 times in length of head. Colour light reddish brown, head lighter; a faint lighter longitudinal band from behind eye to base of caudal. Length of single specimen known 68 mm. (Type in British Museum examined).

Habitat: Off Kei Islands, 232 m!

2. **Tydemania** M. Weber

(M. Weber, Siboga Exp. Fische, 1913, p. 570)

Somewhat elongate, compressed. Head, body, and tail covered with small spinules. Larger and bicuspid ones in pairs along the lateral line which forms a slight curve upwards below the first dorsal. Mouth dorsal, snout somewhat produced, tubular. Nostrils close before eye, the anterior one with a low rim, the posterior with a posterior flap. Lips thick. First dorsal with VI spines, the posterior three minute and not connected by membranes. Second dorsal with 15 rays. Anal with 13 rays. Pectorals somewhat rounded. Dorsal and ventral spines with strong, distant, antrorse barbs. A single small soft ray in the axil of the ventral spine. Gill opening not reaching downwards to horizontal through lower border of eye.

Distribution that of the single species known.

1. **Tydemania navigatoris** M. Weber (Fig. 69, p. 266)

Tydemania navigatoris M. Weber, Siboga Exp. Fische, 1913, p. 571.
Tydemania navigatoris Myers, Smithson. Miscell. Coll. 91, No. 9, 1934, p. 8.
Tydemania navigatoris Kamohara, Ann. Zool. Jap. 16. No. 1, 1937, p. 6.
Tydemania navigatoris Fraser-Brunner, Ann. Mag. Nat. Hist. (11) VII, 1941, p. 429.

D^1. VI. D^2. 15. A. 13. P. 12. V. I. 1.

Height 3, 3.5 in length with caudal. Head 2.6, 3 in length with caudal. Eye 2.6, equal to snout. Interorbital space flat, twice in eye. Upper jaw with a single row of 20 truncated teeth, lower jaw with about 20 similar teeth. First dorsal originating above gill opening, its first spine as long as distance between tip of snout and middle of eye; second spine as long as head without snout; third spine less than half length of second; following spines minute. Longest dorsal rays as long as eye. Anal similar to, but shorter than second dorsal, its origin below the 7th dorsal ray, its end behind that of second dorsal. Pectorals as long as eye. Ventral spine as long as first dorsal spine, a rounded, flat appendage at its base, a minute ray behind it. Pelvis tapering posteriorly, but not ending in a spine, its width 1.45 in horizontal diameter of eye, and 2.5 in its own length. Caudal rounded. Length of type, described above, 65 mm.

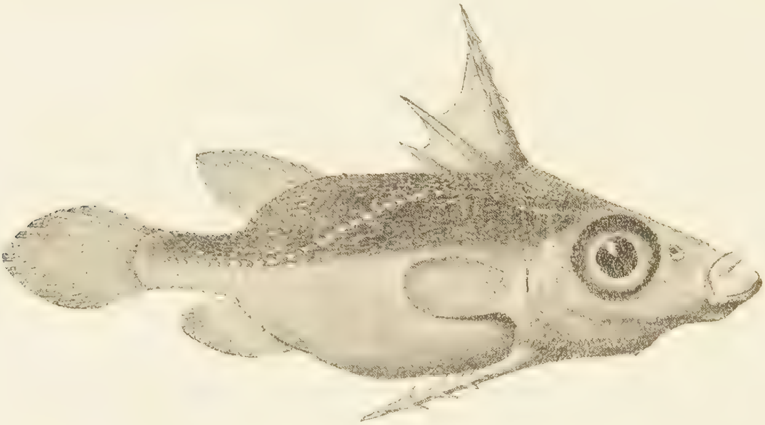

Fig. 69. *Tydemania navigatoris* M. Weber. × 5/3.

Habitat: Madura Sea, 289 m! — Philippines, Japan.

3. **Atrophacanthus** Fraser-Brunner

(Fraser-Brunner, Dana-Rep. No. 35, 1950, p. 3)

Rather elongate. Snout short. Head, body, and tail covered with transversely elongate denticles, each with three spinules. Mouth sub-dorsal, with conical teeth in both jaws, the lower lip expanded laterally. First dorsal with VI spines, the 4th, 5th, and 6th often minute and deeply imbedded. Second dorsal with 13-15 rays. Anal with 11-12 rays. Dorsal and ventral spines with antrorse barbs. A single soft ray in axil of ventral spine. Gill opening relatively wide, extending downwards beyond horizontal through lower border of eye.

Distribution that of the single species known.

1. **Atrophacanthus danae** Fraser-Brunner (Fig. 70, p. 267)

Atrophacanthus danae Fraser-Brunner, Dana-Rep. No. 35, 1950, p. 3.

D^1. VI. D^2. 13-15. A. 11-12. P. 14. V. I. 1.

Height 3.25 and equal to length of head. Eye 2.5. Snout 4, postorbital distance 2.75 in head. Interorbital space equal to postorbital distance. Width of gill opening equal to length of snout. Mouth small, transverse, placed dorsally, the lower jaw bent up almost vertically, the angles prominent. Lips well developed, the lower one having a lobe on each side, broad and loosely folded at the angle; 20-24 strong, conical teeth in each jaw, the anterior lower ones the longer, almost caniniform. Two nostrils, the first with a flap. Spinous dorsal originating above upper end of gill opening, with three well developed spines; the first as long as head, bearing numerous small asperities and 3 or 4 larger ones pointing downward on each lateral edge, the tip of the spine being naked and grooved, the second and third spines progressively shorter, also bearing small asperities; the tip of a small imbedded fourth spine is apparent, but fifth and sixth are generally not visible externally. First three dorsal rays simple, the 8th the longest. Anal commencing below third dorsal ray and ending below the twelfth, the first two simple, the 7th longest. Pelvic spines much longer than first dorsal spine, each with numerous small asperities and 4 or 5 larger antrorse ones on each outer edge, the points of the spines naked and grooved. A small ray supporting a low membrane in the axil of the spine. Length of pelvis equal to length of head, its anterior width contained 5.5 times in its length. Caudal truncate. Length of caudal peduncle 1.5 in length of head, its anterior depth equal to diameter of eye. No evident lateral line. No pigmentation. Length 44 mm. (After Fraser-Brunner, not seen by me).

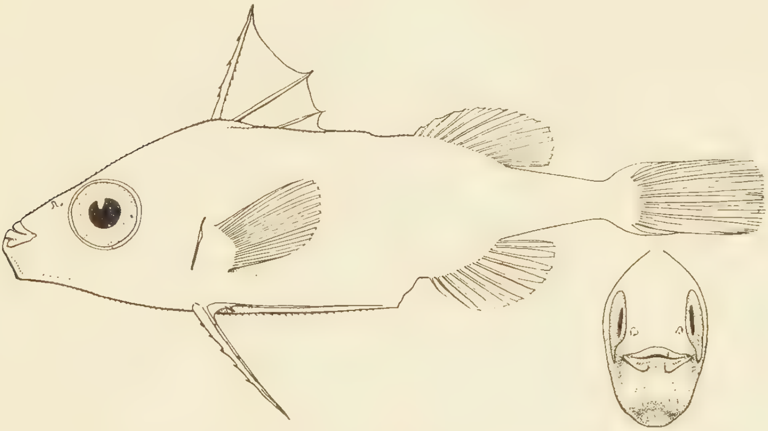

Fig. 70. *Atrophacanthus danae* Fraser-Brunner. After Fraser-Brunner.

Habitat: Celebes Sea, 600-5000 m of wire out.

Note. Fraser-Brunner l.c. describes the larval stages which show likeness to Ostraciontoid types.

4. **Halimochirurgus** Alcock

(Alcock, Proc. Asiat. Soc. Bengal, 1899, p. 78)

Somewhat elongate. Snout produced into a long tube. Mouth very small, dorsal. Conical teeth in both jaws. Head, body, and tail covered with small, granular scales, most of which bear a small spinule. First dorsal with II-III spines, second dorsal with 12-13 rays. Anal with 11-12 rays. Ventrals consisting of a single spine. Lateral line inconspicuous. Gill opening small, not reaching below middle of pectoral base.

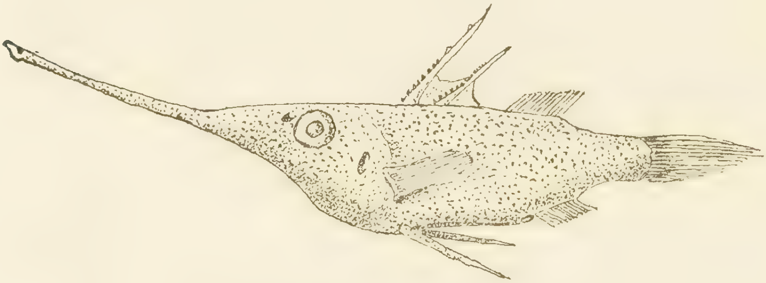

Fig. 71. *Halimochirurgus alcocki* M. Weber. × 3/4 nat. size.

Distribution: Three species known from off Cape Comorin, Philippines, and Arafura Sea.

1. **Halimochirurgus alcocki** M. Weber

Halimochirurgus alcocki M. Weber, Siboga Exp. Fische, 1913, p. 571.
Halimochirurgus macraulos Fowler, Proc. Acad. Nat. Sci. Philadelphia LXXXV, 1934, p. 367.
Halimochirurgus macraulos Kamohara, Ann. Zool. Jap. 16, No. 1, 1937, p. 8.
Halimochirurgus alcocki Fraser-Brunner, Ann. Mag. Nat. Hist. (11) VII, 1941, p. 429.

D^1. II. D^2. 12-13. A. 12. P. 11-12. V. I.

Height 5.2-5.6. Head 1.6-1.7. Eye 7.2-7.6, 5.75-6 in snout. Interorbital space slightly concave, 1.4 in eye. First dorsal originating above gill opening, the length of the first spine equal to the height of the body; the length of the second spine 1.15 in that of the first, both spines ridged and covered with asperities except the tip; the first spine with some antrorse barbs. Origin of anal below middle of second dorsal, its end behind that of second dorsal.

Pectorals about as long as head without snout. Ventral spine ridged, covered with asperities except at the tip, and with some antrorse barbs, much longer than first dorsal spine and 2.5 in head. Pelvis scarcely tapering posteriorly, rounded behind, its length 3 in head, its width anteriorly 5 in its length. Length of caudal peduncle equal to eye, its depth 1.1 in its length. Colour of preserved specimens silvery, light brown above. Length 193 mm.

Habitat: Arafura Sea, 304 m! — Off northern Mindanao, 204 m, Japan.

2. Family **Triacanthidae**

Compressed, covered with small, ridged scales which do not overlap. Caudal peduncle long, tapering towards base of caudal which is forked. Hindpart of cranial roof formed by supraoccipital which is elevated, exoccipital confined to back of skull. Frontals not reaching forward to meet premaxillary pedicels. First dorsal with V spines. Second dorsal with 20-25 rays. Anal with 15-20 rays. Ventrals consisting of a single long spine. Teeth in 2 series in each jaw, 10 in each outer series, incisor-like; those of the inner series obtuse, rounded, 6 in the upper jaw, 2 in the lower.

Distribution: Shore fishes, some species entering rivers, from Indic and western parts of Pacific.

Key to the Indo-Australian genera of Triacanthidae

1. Second dorsal spine much less than half length of first spine. Scales with a prominent spinule on top of a cruciform ridge	1. *Triacanthus* p. 269.
2. Second dorsal spine more than half length of first spine. Scales with several transverse ridges	2. *Pseudotriacanthus* p. 275.

1. **Triacanthus** (Cuvier) Oken

(Cuvier, Règne Animal. ist. ed. 1817, p. 153 "Les Triacanthes", Oken, Isis 1817)

Body compressed, covered with small scales with a prominent spinule on top of a cruciform ridge. Caudal peduncle rather long and tapering to base of caudal. Mouth small. Branchiostegals 6. Pseudobranchiae present. Gill opening a short nearly vertical cleft in front of base of pectorals. First dorsal with one strong, rough spine and four smaller ones, the second spine much less than half length of first spine. Second dorsal with 20-25 rays. Anal with 15-20 rays, its base more than half as long as that of soft dorsal. Ventral fins each represented by a strong, rough spine, similar to the first dorsal spine. Pectorals small, more or less rounded. Caudal forked. Lateral line conspicuous.

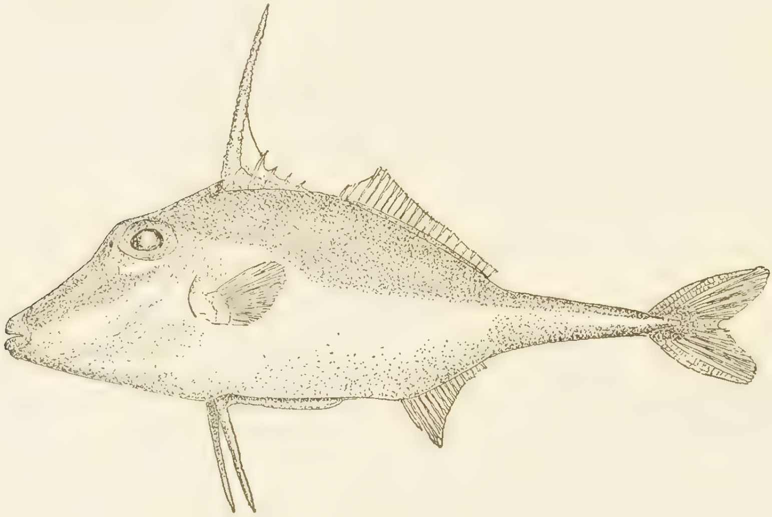

Fig. 72. *Triacanthus blochi* Blkr. nat. size.

Key to the Indo-Australian species of Triacanthus

A. Snout concave. Pelvis between ventral spines tapering to a distinct point posteriorly.
  a. Membrane between anterior two spines of first dorsal dark. Length of caudal peduncle 4.5 in length without caudal . . . . . . 1. *T. biaculeatus* p. 270.
  b. Membrane of spinous dorsal immaculate.
    a¹. Length of caudal peduncle 4.3-4.9 in length without caudal . . . . 2. *T. blochi* p. 271.
    b¹. Length of caudal peduncle 6.1-6.4 in length without caudal . . . . 3. *T. oxycephalus* p. 272.
B. Snout straight. Pelvis between ventral spines scarcely narrowed posteriorly. Membrane of spinous dorsal more or less dark. Interorbital space with a more or less distinct median ridge.
  a. Height 2.5-2.6. Basal part of first dorsal spine and membrane of spinous dorsal dark . 4. *T. brevirostris* p. 273.
  b. Height 1.87. Membrane of first dorsal dark between first and third spines . . . . . 5. *T. nieuhofi* p. 275.

1. **Triacanthus biaculeatus** (Bl.)

Balistes biaculeatus Bloch, Naturgesch. Ausländ. Fische 2. Theil, 1786, p. 19.
Balistes biaculeatus Bloch Schneider, Syst. Ichth. 1801, p. 475.

Triacanthus biaculeatus Cuvier, Règne Animal II, 1817, p. 152.
Triacanthus angustifrons Hollard, Ann. Sci. Nat. (4) I, 1854, p. 45.
Triacanthus macrurus Bleeker, Atl. Ichth. V, 1865, p. 91. — Ned. Tijdschr. Dierk. III, 1866, p. 51.
Triacanthus biaculeatus Günther, Cat. Brit. Mus. VIII, 1870, p. 210 (partim).
Triacanthus biaculeatus Tate Regan, Proc. Zool. Soc. London, 1903, p. 182.

D^1. V. D^2. 23. A. 18. P. 14. V. I.

Height 2.5, 3.3 in length with caudal. Head 3.4, 4.5 in length with caudal. Eye 3.7, 3 in snout (measured from its tip to the anterior border of eye). Interorbital space slightly concave, slightly more than eye. Upper profile of snout slightly concave. First dorsal spine slightly more than length of head. Second dorsal spine one sixth of first one; following spines slightly decreasing in length to the last. Distance between end of first dorsal and beginning of second dorsal somewhat more than longest diameter of eye. Longest rays of second dorsal slightly more than eye. Base of anal nearly 1.5 in that of second dorsal. Pectorals rounded, equal to distance between eye and origin of first dorsal. Ventral spine shorter than first dorsal one. Pelvis between ventral spines narrow, tapering in a distinct point posteriorly. Caudal deeply forked. Caudal peduncle tapering to base of caudal, its length 4.5 in length of fish without caudal, its greatest depth 1.85 in its length. About 45 scales between end of second dorsal and end of anal. Colour of preserved specimens silvery, back and snout light brownish. Base of first dorsal and membrane between first and second spines dark brown. Length 215 mm.

Habitat: Java (Jakarta); Celebes (Makassar?, North Celebes?); Aru Island!; Misol?; New Guinea. — China, Australia.

Note. Günther, l.c., united Bleeker's species *oxycephalus, blochi,* and *macrurus* with *biaculeatus*. Most authors followed him but Regan, l.c., proved that Bleeker's species, except *macrurus,* are valid. Hence it is impossible to say what species is meant when authors between 1870 and 1903 record "*biaculeatus*" from a certain locality.

2. **Triacanthus blochi** Blkr (Fig. 72, p. 270)

Triacanthus Blochii Bleeker, Nat. Tijdschr. Ned. Indië III (1851) 1852, p. 81 (sine syn.).
Triacanthus biaculeatus Bleeker, Acta Soc. Sci. Indo-Neerl. VI, 1859. Enumeratio spec. Piscium etc. p. 196 (nec Bl.).
Triacanthus Blochi Bleeker, Atlas Ichth. V, 1865, p. 89.
Triacanthus biaculeatus Günther, Cat. Brit. Mus. VIII, 1870, p. 210 (partim).
Triacanthus blochi Tate Regan, Proc. Zool. Soc. London 1903, p. 182.
Triacanthus blochi Fowler & Bean, Proc. U. S. Nat. Mus. LXII, art. 2, 1922, p. 60.

Triacanthus blochii Herre, Philipp. Journ. Sci. XXV, No. 4, 1924, p. 419.
Triacanthus blochii Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 447.
Triacanthus blochi Inger, Fieldiana 36, No. 3, 1957, p. 401.

D^1. V. D^2. 1.20-1.22. A. 1.15-1.16. P. 1.11.1. V. I.

Height 2.5-2.7, 3.2-3.5 in length with caudal. Head 3.2-3.4, 3.9-4.2 in length with caudal. Eye oval, 2.8-3.1, 1.9-2.4 in snout (measured from its tip to the anterior border of eye). Interorbital space about equal to eye. Upper profile of snout slightly concave. Interorbital space slightly concave. First dorsal spine equal to or longer than head. Length of second dorsal spine about 4.5 in that of first; following spines somewhat decreasing in length to the last. Distance between end of first dorsal and beginning of second dorsal less than longest diameter of eye. Longest rays of second dorsal about as long as eye. Base of anal 1.6-1.8 in that of second dorsal. Pectorals rounded, as long as distance between eye and origin of first dorsal. Ventral spine shorter than first dorsal one. Pelvis between ventral spines narrow, tapering to a point posteriorly. Caudal forked. Caudal peduncle tapering to base of caudal, its length 4.3-4.9 in length of fish without caudal, its greatest depth 1.7-1.9 in its length. About 35-40 scales between end of second dorsal and end of anal. Colour of preserved specimens light brownish above, silvery on sides and below. Fins hyaline or yellowish. Length 150 mm.

Habitat: Singapore; Sumatra (Padang); Bintang; Banka; Java (Jakarta, Probolinggo); Borneo (Sandakan); Celebes (Makassar!); Saleyer!; Ambon; New Guinea. — Malay Peninsula, China, Philippines.

Nomen indig.: Sokang (Jakarta). Sonang-Sonang (Indonesia).

3. **Triacanthus oxycephalus** Blkr.

Triacanthus oxycephalus Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 496. — Verh. Bat. Gen. XXIV, 1952. Bijdr. kennis Balistini, p. 27. — Atl. Ichth. V, 1865, p. 90.
Triacanthus biaculeatus Günther, Cat. Brit. Mus. VIII, 1870, p. 210 (partim).
Triacanthus oxycephalus Tate Regan, Proc. Zool. Soc. London 1903, p. 183.
?*Triacanthus oxycephalus* Fowler, Proc. Acad. Nat. Sci. Philadelphia (2) LVII, 1905, p. 507.
Triacanthus oxycephalus Annandale & Jenkins, Mem. Indian Mus. III, No. 1, 1910, p. 11.
Triacanthus oxycephalus Herre, Philipp. Journ. Sci. XXV, No. 4, 1924, p. 422.
Triacanthus oxycephalus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 448.
?*Triancanthus oxycephalus* Fowler, Proc. Acad. Nat. Sci. Philadelphia 89, 1938, p. 259, fig. 290, p. 262.

D^1. V. D^2. 25. A. 19. P. 1. 12.1. V. I.

Height 2.3-2.4, 3 in length with caudal. Head 3.2-3.25, 4.1 in length with caudal. Eye oval, 2.8-3.2, 2.1-2.3 in snout (measured from its tip to anterior border of eye). Interorbital space somewhat more or less than eye. Upper profile of snout somewhat concave. Interorbital space flat. First dorsal spine equal to distance between tip of snout and axil of pectoral. Second dorsal spine one fifth of length of first one; last spine minute. Distance between end of first dorsal and beginning of second dorsal somewhat more or less than eye. Longest dorsal rays slightly less than eye, shorter than longest anterior rays of anal. Base of anal 1.5-1.8 in that of second dorsal. Pectorals rounded, shorter or much shorter than distance between eye and origin of first dorsal. Ventral spine about as long as head. Pelvis tapering to a point posteriorly, in large specimens less distinctly. Caudal forked. Caudal peduncle tapering to base of caudal, its length 6.1-6.4 in length of fish without caudal, its greatest depth 1.3-1.6 in its length. About 32-35 scales between end of second dorsal and end of anal. Colour of preserved specimens silvery, a brownish hue on back. Snout brownish, but a silvery ring along frontborder of eye, reaching to nostrils. Length 160 mm. (A specimen of Bleeker's collection in the Amsterdam Museum examined).

Habitat: Singapore; Sumatra (Priaman, Padang, eastern coast); Bintang; Banka; Java (Jakarta, Japara, Pasuruan); Borneo?; Celebes (Makassar); Ambon; New Guinea. — Coast of Orissa, Lower Burma, Siam?, Philippines.

Note. I doubt if the specimen described by Fowler (1905, l.c.) from Borneo belongs to *oxycephalus*, as the length of the caudal peduncle is said to go $4^1/_6$ times in the length of the fish. Also the specimens figured by Fowler (1938, l.c.) from Siam are probably not this species, the membrane between the anterior dorsal spines being dark and the caudal represented as rounded.

4. **Triacanthus brevirostris** Schlegel

Triacanthus brevirostris Schlegel, Fauna Japonica, Pisces, pt. 6, 1850, p. 294.
Triacanthus Russellii Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 25.
Triacanthus rhodopterus Bleeker, l.c.
Triacanthus brevirostris Hollard, Ann. Sci. Nat. (4) I, 1854, p. 44.
Triacanthus brevirostris Bleeker, Atl. Ichth. V, 1865, p. 91 (sine syn.).
Triacanthus brevirostris Kner, Novara Exp. Fische I, 1865-1867, p. 393.
Triacanthus brevirostris Günther, Cat. Brit. Mus. VIII, 1870, p. 209 (partim).
Triacanthus brevirostris Rutter, Proc. Acad. Nat. Sci. Philadelphia 1897, p. 79 (sine syn).
Triacanthus, brevirostris Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 253.

Triacanthus brevirostris Tate Regan, Proc. Zool. Soc. London 1903, p. 183.
Triacanthus brevirostris Herre, Philipp. Journ. Sci. XXV, No. 4, 1924, p. 418.
Triacanthus brevirostris Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 448. — Journ. Bombay Nat. Hist. Soc. 33, 1928, p. 119. — Proc. Acad. Nat. Sci. Philadelphia 89, 1938, Fig. 259, fig. 289, p. 262.
Triacanthus brevirostris Boeseman, Zool. Med. Leiden. XXVIII, 1947, p. 211.
Triacanthus brevirostris Inger, Fieldiana 36, no. 3, 1957, p. 402.

D^1. V. D^2. 23-24. A. 19. P. 13-14. V. I.

Height 2.5-2.6, 3.2-3.4 in length with caudal. Head 3.3-3.6, 4.3-4.6 in length with caudal. Eye 2.9-3.3, 1.8-2.3 in snout (measured from its tip to anterior border of eye). Interorbital space flat or slightly concave with a more or less developed median ridge, equal to or slightly more than eye. Upper profile of snout straight. First dorsal spine slightly more or less than head, second spine more than thrice in first spine, following spines decreasing in length to the last. Longest dorsal rays about as long as eye. Anterior anal rays longer than posterior ones, longer than dorsal rays. Base of anal 1.4-1-6 in that of second dorsal. Pectorals slightly rounded, slightly shorter than or almost equal to distance between eye and base of first dorsal spine. Ventral spine shorter than first dorsal one. Pelvis between ventral spines rather broad, scarcely tapering posteriorly. Caudal forked. Caudal peduncle tapering to base of caudal, its length 4.6-5.3 in length of fish without caudal, its depth 1.5-1.6 in its length. About 40-45 scales between end of second dorsal and end of anal. Colour of preserved specimens silvery, back and snout light brownish. Basal part of first dorsal spine and membrane of first dorsal fin dark brown. Length over 260 mm.

Nomen indig.: Sunjang langit. Pahal pahal (Balikpapan).

Habitat: Singapore; Sumatra (Padang, Siboga, Bagan Si Api Api); Bintang; Banka; Java (Jakarta, Bantam, Samarang, Surabaya, Malang, Pasuruan, Prigi); Madura; Borneo (Kahajan, Banjermasin, mouth of Kapuas, Baram river, Balikpapan, Sandakan); Celebes (Makassar!, Tello!, Bulakomba, Badjoa); Batjan; Buru, Ambon!; Flores Sea!; New Guinea. — Malacca, Siam, Tonkin, China, Korea, southern Japan, Philippines, Port Darwin, Admirality Islands. In sea and brackish water, entering fresh water.

Note. *Triacanthus indicus* Regan (Proc. Zool. Soc. London 1903, pp. 181 and 184) from the Gulf of Iran eastwards to Penang hardly differs from *brevirostris.* I compared a specimen of *indicus* from India with one of *brevirostris* of the same length; the only difference I could find is that the snout is slightly longer in *indicus.* It can best be treated as a western subspecies of *brevirostris.*

5. **Triacanthus nieuhofi** Blkr

Triacanthus Nieuhofi Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 26. — Nat. Tijdschr. Ned. Indië III, 1852, p. 459.
Triacanthus brachysoma Bleeker, Nat. Tijdschr. Ned. Indië IV, 1853, p. 128.
Triacanthus Nieuhofi Bleeker, Atlas Ichth. V, 1865, p. 92.
Triacanthus brevirostris Günther, Cat. Brit. Mus. VIII, 1870, p. 209 (partim).
Triacanthus brevirostris, var. *Nieuhofi* Von Martens, Exp. nach O. Asien, Berlin 1876, p. 407.
Triacanthus nieuhofi Tate Regan, Proc. Zool. Soc. London 1903, p. 184.
Triacanthus margarethae Pietschmann, Zool. Anz. 91, Heft 5/9, 1930, p. 147.

D^1. V. D^2. 24-25. A. 19-20. P. 14-15. V. I.

Height 1.5-2.28, 2.4-2.8 in length with caudal. Head 3.1-4, 4.2-4.9 in length with caudal. Eye 2.7-3.2, 1.8-2.3 in snout (measured from its tip to anterior border of eye). Interorbital space flat with a more or less distinct median ridge, equal to or somewhat more than eye. Upper profile of snout straight or nearly so. First dorsal spine equal to its distance from tip of snout or nearly so; length of second spine more than 4 or 5 times in that of first spine, following spines decreasing in length posteriorly. Longest dorsal rays equal to eye or somewhat longer. Anterior anal rays longer than posterior ones, longer than dorsal rays. Base of anal 1.3-1.4 in that of second dorsal. Pectorals rounded, less than distance between eye and base of first dorsal spine. Ventral spine much shorter than first dorsal spine. Pelvis between ventral spines rather broad, scarcely tapering posteriorly. Caudal forked. Caudal peduncle tapering towards base of caudal, its length 4.1-4.8 in length of fish without caudal. About 35-40 scales between end of second dorsal and end of anal. Colour of preserved specimens silvery, back and snout greyish. Membrane between first and third dorsal spines dark brown, hyaline in young ones. In small specimens there is often a broad dark band running from base of first dorsal spine to ventrals. These specimens have been described by Bleeker as *T. brachysoma* and by Pietschmann as *T. margarethae*. Length 280 mm. (Specimens of Bleeker's collection in the Amsterdam Museum examined).

Habitat: Singapore; Sumatra (Benkulen, Padang, Priaman, Siboga); Nias; Bintang; Banka; Java (Jakarta, Bantam, Palabuan Batu, mouth of river Solo); Borneo (Sampit); Celebes (Makassar); Batjan; Halmahera; Buru; Ceram; Ambon; Biak! — China.

2. **Pseudotriacanthus** Fraser-Brunner

(Fraser-Brunner, Ann. Mag. Nat. Hist. (11) VII, 1941, p. 429)

Body compressed, covered by small scales which have several transverse ridges. Mouth small. Gill opening restricted. First dorsal with V spines, the second spine more than half the length of the first spine. Second dorsal with 23 rays. Anal with 17 rays, its base half as long as that of second dorsal. Lateral line conspicuous.

Distribution that of the single species known.

1. **Pseudotriacanthus strigilifer** (Cantor) (Fig. 73, p. 277)

Triacanthus strigilifer Cantor, Journ. Asiat. Soc. Bengal XVIII, Part II, 1850, p. 1345.

Triacanthus longirostris Hollard, Ann. Sci. Nat. (4) I, 1854, p. 46.

Triacanthus strigilifer Bleeker, Acta Soc. Sci. Indo-Neerl. II, 1857. Achtste bijdr. kennis vischfauna Amboina, p. 97. — Atlas Ichth. V, 1865, p. 89.

Triacanthus strigilifer Günther, Cat. Brit. Mus. VIII, 1870, p. 211.

Triacanthus strigilifer Day, Fishes of India, Part IV, 1878, p. 685.

Triacanthus strigilifer Tate Regan, Proc. Zool. Soc. London 1903, p. 182.

Triacanthus strigilifer Annandale & Jenkins, Mem. Indian Mus. III, No. 1, 1910, p. 11.

Triacanthus strigilifer Herre, Philipp. Journ. Sci. XXV, 1924, p. 421.

Triacanthus strigilifer Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 447. — Proc. Acad. Nat. Sci. Philadelphia 89, 1938, p. 259, fig. 291, p. 202.

Triacanthus strigilifer Blegvad, Fishes Iranian Gulf. Danish Sci. Invest. Iran, Part III, 1944, p. 211.

Pseudotriacanthus strigilifer Munro, The marine and fresh water fishes of Ceylon, 1955, p. 273.

D^1. V. D^2. 1.22 A. 1.16. P. 1.11. V. I.

Height 2.57, 3.06 in length with caudal. Head 3.3, 3.97 in length with caudal. Eye oval, 3, 2.16 in snout and equal to interorbital space. Profile of head with a slight concavity between tip of snout and nostrils, straight and slightly less oblique from there to base of dorsal. Interorbital space flat. First dorsal spine strong, as long as distance between corner of mouth and gill opening. Second dorsal spine les strong, as long as distance between corner of mouth and lower border of eye, third as long as longest diameter of eye, and 2.5 in length of second spine, fourth shorter than third spine, fifth shorter than fourth spine. Distance between end of first dorsal and beginning of second dorsal equal to longest diameter of eye. Median rays of soft dorsal twice as long as last rays and about as long as third dorsal spine. Origin of anal below tenth dorsal ray. Base of anal 1.8 in that of second dorsal. Anterior anal rays longer than longest dorsal rays. Anal rays gradually decreasing in length posteriorly, the last one half as long as the anterior ones. Pectorals as long as anterior anal rays and equal to half length of snout. Ventral spines as strong as first dorsal spine, but somewhat shorter. Caudal forked. Caudal peduncle tapering to base of caudal, its length 4.75 in length of fish without caudal, its greatest depth 1.6

in its length. About 40 scales between end of second dorsal and end of anal. Scales with several transverse ridges and without prominent spines. Colour of preserved specimens brown above, yellowish below. Fins yellowish hyaline. Length 172 mm.

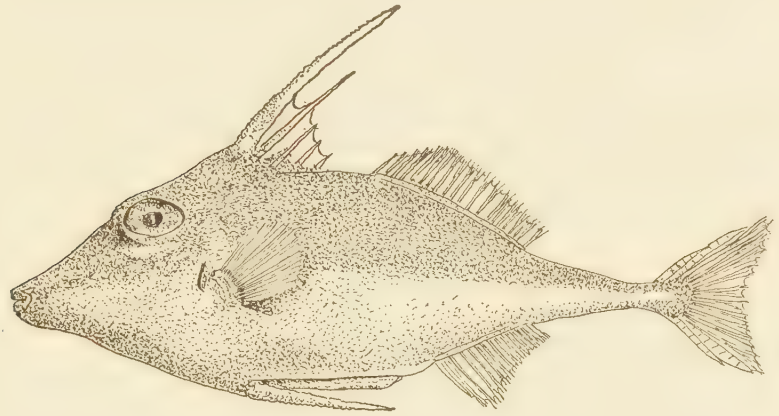

Fig. 73. *Pseudotriacanthus strigilifer* (Cantor). × 2/3.

Habitat: Singapore; Ambon; New Guinea-Muscat, Persian Gulf, coast of India, coast of Malaya, Siam, China, Philippines.

TRIACANTHIDE LARVA

Triacanthodes? spec. juv. M. Weber, Siboga Exp. Fische, 1913, p. 573.

M. Weber, l.c., figured and described a fish larva of 6 mm total length, from the plankton of the Banda Sea which certainly is a triacanthiform but which puzzled the author as he counted 8 dorsal spines and as no species of this group is known with such a high number of dorsal spines. As the nearest approach he suggested a young *Triacanthodes,* the known species of this genus having 6 dorsal spines. Re-examination of the specimen showed me that the figure is in so for incomplete, as the articulations of the spines with their pterygophores are clearly visible, but not represented in the drawing. I count 5 pterygophores and 5 articulations, and, as the caudal peduncle is tapering to the caudal base it is almost certain that the specimen is a *Triacanthide* larva. The high number of dorsal spines which are not so regularly arranged as represented in the drawing, can be explained by assuming that some of the spines have split into their right and left halves.

3. Family BALISTIDAE

Compressed. Body covered with more or less imbricate osseous scales. Premaxillary firmly united with maxillary. Teeth not coalesced, the outer series in both jaws more or less pointed, eight in number; the upper jaw with an inner series of six flattened plate-like teeth attached to the outer ones. Two dorsals, the first with III spines, the first spine strong, the second spine locking the first when erect. The second dorsal and the anal long, with branched rays. Pelvic bones co-ossified. Ventrals fused into a single, generally movable, spine.

Distribution: Marine fishes of all warm seas.

1. **Balistes** Linné

(Linné, Syst. Naturae. Ed. 10. I, 1758), p. 327)

For characters of the genus see those of the family.

Note. Most recent authors accept the numerous genera in which the old genus *Balistes* has been divided. In the following key which is based on Fraser-Brunner's key to the genera of Balistidae (Ann. Mag. Nat. Hist. (10) XV, 1935, p. 658), these genera have been mentioned, as far as they are represented in the Indo-Australian Archipelago.

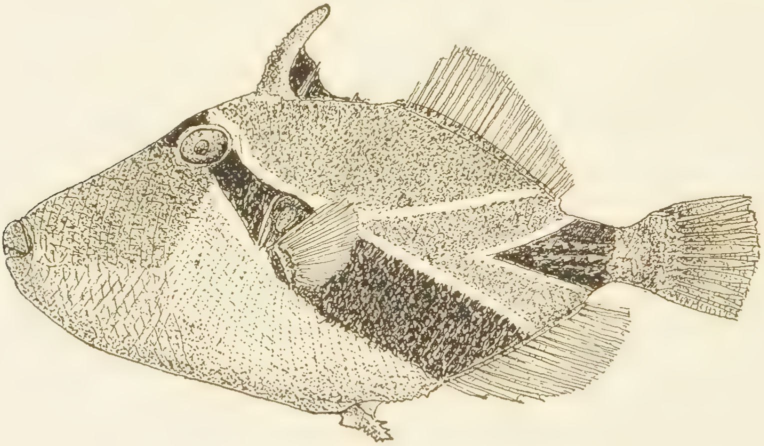

Fig. 74 *Balistes echarpe* (Lac.) Ann. × 3/4.

Key to the Indo-Australian species of Balistes

I. Osseous plates developed behind gill opening.

- A. A deep groove before the eye, below the nostril.
  - 1. Teeth not red, none greatly produced. Scales moderate or small.
    - a. Scales of body and tail without large tubercles or spines. Dorsal and anal more or less elevated anteriorly, angulate. Profile of head convex.
      - a^1. Least depth of caudal peduncle almost twice in its length. Anterior rays of dorsal and outer rays of caudal filamentous in large specimens (*Balistes* s. str.) . . . 1. *B. vetula* p. 282.
      - b^1. Least depth of caudal peduncle slightly more than once in its length. No produced dorsal rays. Caudal rays sometimes slightly produced. Teeth even, incisor-like (*Melichthys*).
        - a^2. Dark, fins included. A narrow light band along bases of second dorsal and anal . . . . 2. *B. radula* p. 283.
        - b^2. Dark, fins light. Second dorsal and anal narrowly bordered by black . . . . 3. *B. vidua* p. 284.
    - b. Scales, at least of tail, with large tubercles or spines.
      - a^1. Caudal peduncle depressed, as broad as deep. Caudal emarginate, the outer rays produced (*Abalistes*) . . . . 4. *B. stellatus* p. 285.
      - b^1. Caudal peduncle laterally compressed.
        - a^2. Profile convex. Caudal rounded (*Balistoides*).
          - a^3. A dark band over interorbital space, continued below eye over gill opening to base of pectoral . . 5. *B. viridescens* p. 287.
          - b^3. Lower half of sides and tail with large round white blotches. 6. *B. conspicillum* p. 288.
        - b^2. Profile straight. Caudal fin truncate or slightly emarginate (*Sufflamen*).
          - a^3. Scales of middle of cheeks rectangular.

Dark. A white horizontal band from mouth to below postorior border of eye . . . . 7. *B. fraenatus* p. 290.

b³. Scales of cheeks rhombic.

a⁴. Dark, chin lighter. Caudal dark with a broad, white terminal band, the outer rays also white . 8. *B. chrysopterus* p. 292.

b⁴. Light, a dark curved band from eye to base of pectoral. Caudal light . . . . . 9. *B. bursa* p. 294.

2. Teeth red, two upper lateral ones produced, fang-like. Scales large. Outer rays of caudal much produced (*Odonus*) . . . . 10. *B. erythrodon* p. 295

B. Groove before eye shallow or wanting. Teeth white, uneven, notched.

1. Cheeks completely scaled. Sides of tail with 2-5 straight parallel rows of forward directed spines. Soft dorsal and anal not elevated. Caudal fin truncate.

a. Third dorsal spine well developed. Caudal peduncle not unusually constricted, its length 1.3-1.5 in its depth, bearing about 6 large spines in two rows. Dark with parallel more or less undulating bands (*Balistapus*) . . 11. *B. undulatus* p. 297.

b. Third dorsal spine minute. Caudal peduncle much constricted, its depth 1.25-1.5 in its length, 2-5 rows of spines on caudal peduncle and posterior part of tail. Light stripes over interorbital space and from below eye to base of pectoral (*Rhinecanthus*) . . . .

a¹. 4-5 rows of spines on caudal peduncle and posterior part of tail. A dark band from eye to gill opening and base of pectoral, continued as a very broad band to anus and base of anal, bordered superiorly by a light stripe which bifurcates below origin of dorsal, one branch going to end of base of dorsal, the other to that of anal. Caudal peduncle dark brown, the dark colour produced into a point on posterior part of tail and bordered by white stripes, forming an acute angle, parallel to that of the bifurcations before it . . 12. *B. echarpe* p. 299.

b^1. 3 rows of spines, the upper one short, on tail only. A large dark patch on sides, a dark saddle on caudal peduncle . . . . 13. *B. verrucosus* p. 301.

c^1. 3 rows of spines, the lower one short and on caudal peduncle only, 4 light oblique bands from middle of sides to base of anal . . 14. *B. aculeatus* p. 303.

2. Cheeks largely naked anteriorly, at least in adults, posteriorly with scales smaller than those of the body, in horizontal lines. Soft dorsal and anal elevated (*Pseudobalistes*).

a. No spines or tubercles on caudal peduncle and tail . . . . . . 15. *B. fuscus* p. 305.

b. 5-6 rows of spines on caudal peduncle and posterior part of tail . . . . 16. *B. flavimarginatus* p. 306.

II. No osseous plates behind the gill opening. A groove before the eye. Soft dorsal and anal elevated anteriorly. Caudal peduncle compressed. Caudal fin subtruncate or emarginate.

A. Third dorsal spine minute. Scales on cheeks larger than those on body, somewhat fused together in longitudinal rows, between which are three or more long, narrow, naked areas or grooves. Pelvic spine movable. Scales with tubercles at least posteriorly (*Xanthichthys*) . . . . 17. *B. ringens* p. 308.

B. Third dorsal spine well developed. Cheeks completely scaled without grooves. Pelvic spine scarcely movable or quite fixed. Scales with spines or in adults with a median keel (*Canthidermis*) . . . . 18. *B. rotundatus* p. 309.

1. **Balistes vetula** L.

Balistes vetula Linné, Syst. Naturae, Ed. 10, Vol. I, 1758, p. 327.
Balistes vetula Bloch, Naturgesch. Ausländ. Fische II, 1786, p. 22.
Balistes vetula Bloch Schneider, Syst. Ichth. 1801, p. 470.
Balistes vetula Lesson, Voyage Coquille, Zoologie, 1830, p. 114.
Balistes vetula Hollard, Ann. Sci. Nat. 1854, I, p. 305.
Balistes vetula Günther, Cat. Brit. Mus. VIII, 1870, p. 215.
Balistes vetula Day, Fishes of India, Part IV, 1878, p. 688.
Balistes vetula J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 407.

D^1. III. D^2. 2.28. A. 2.26. P. 1.14. Sq. l. about 63, Ltr. 33.

Upper profile of head slightly arched. Height 2.1, 2.39 in length with caudal (without caudal filaments). Head 3, 3.46 in length with caudal (without caudal filaments). Eye 3.9, 3.3 in snout and 1.1 in slightly convex interorbital space. A deep, narrow slit before eye, below nostrils which are situated in a pit. Gill opening somewhat oblique, its lower end in vertical through hindborder of eye. A series of large bony plates behind gill opening. Second and third dorsal rays prolonged into a single long filament. Anterior anal rays longest, forming a point, the free margin of the fin sigmate. Pectorals rounded. Ventral spine movable, covered by small tubercles or spinules, two small spines at its end. Caudal crescent-shaped, the upper and lower rays produced into long filaments. Caudal peduncle compressed, its least depth 1.68 in its length. No spines or tubercles on scales of tail or elsewhere. Colour of preserved specimen brown. Dark brown lines radiating from eye, some of them connecting both eyes over interorbital space; another running forwards over nostrils and snout; a similar line over snout to below eye and then bent downwards to gill opening. A blue band from snout to base of pectoral and continued a short distance downwards. A similar but shorter band below it and parallel to it, from upper lip to below anterior border of eye. Teeth brownish, but not red. Soft dorsal with a subterminal, longitudinal, dark band; some narrower bands below it. Anal with a similar subterminal band. Caudal with a terminal white and a subterminal dark band, the upper and lower rays also dark. Pectorals yellowish hyaline. Length of specimen described 298 mm.

Habitat: Ambon! — Coast of Natal, Madagascar, coasts of India, China, Atlantic.

Note. The description is made after the single specimen known from the Indo-Australian Archipelago, recorded by Günther (l.c.) from Madame Pfeiffer's collection.

2. **Balistes radula** Sol. Rich.

Balistes ringens Osbeck, Reise nach Ostindien, 1765, p. 386 (nec L.).
?*Balistes niger* Bloch, Ausländ. Fische II, 1786, p. 27.
Balistes ringens Richardson, Zool. Voyage Samarang, 1848, p. 21 (nec L.).
Balistes radula Solander Richardson, ibid. p. 22.
Balistes ringens Bleeker, Acta Soc. Sci. Indo-Neerl. VIII, 1860. Achtste bijdr. kennis vischfauna van Sumatra, p. 69 (nec. L.).
Melichthys ringens Bleeker, Atlas Ichth. V, 1865, p. 108 (nec L.).
Balistes niger Günther, Fishes of Zanzibar, 1866, p. 135.
Balistes buniva Günther, Cat. Brit. Mus. VIII, 1870, p. 227.
Balistes buniva Day, Fishes of India, Suppl. 1888, p. 808.
Balistes (Melanichthys) buniva Steindachner, Denkschr. Akad. Wien LXX, 1900, p. 517.
Melichthys radula Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 417.
Balistes buniva Günther, Fische der Südsee III, 1910, p. 446.
Melichthys radula Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 446.
Melichthys buniva Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 455. — Ibid. XI, No. 5, 1931, p. 365.
Melichthys radula Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 422.
Melichthys ringens J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 408 (nec L.).
?*Melichthys buniva* Koumans, Temminckia IX, 1953, p. 262.
Melichthys ringens Munro, The marine and fresh water fishes of Ceylon, 1955, p. 271. (nec L.).
Melichthys buniva Randall, Atoll Res. Bull. 47, 1955, p. 218, p. 220.

D^1. III. D^2. 2.31. A. 2.26. P. 2.12.1.

Upper profile from tip of snout to base of caudal evenly convex. Height 1.8, 2.1 in length with caudal. Head 3.6, 4.2 in length with caudal. Eye 5.5, 4.5 in snout. Interorbital space very convex. A distinct slit before eye. A superficial groove, beginning in level of mouth and slightly before eye, descending to below inferior end of gill opening. Gill opening nearly vertical, more than one eye diameter behind vertical through hindborder of eye. Cheeks totally scaly. A group of bony plates behind gill opening. Lips not very thick. Median teeth in jaws incisor-like, not longer than the next ones on sides. Origin of first dorsal above gill opening. Front of first dorsal spine with spinules, its length 1.48 in head. Second spine about three fifths of first spine. Third spine minute. Anterior rays of second dorsal and anal longest, the length of the rays diminishing gradually to the last. Longest dorsal rays 1.4, longest anal rays 1.8 in head. Pectorals about 1.8 in head. Scales with regular rows of small tubercles, no greatly enlarged tubercles or spines on scales of tail and caudal peduncle, but scales of tail each with a longitudinal low ridge. Least depth of caudal peduncle almost equal to its length. Head, body, tail, and fins black. Base of dorsal and anal white.

Caudal with a narrow white posterior border, outer upper and lower caudal rays white. Length 500 mm. (After Bleeker, not seen by me).

Habitat: Sumatra (Priaman); Menado?. — Durban, Delagoa Bay, Zanzibar, Seychelles, Mauritius, Ceylon, Christmas Island, China, Philippines, Pacific eastwards as far as Cocos Island, tropical Atlantic.

Note. The only specimen with certainty known from the Indo-Australian Archipelago is that from Priaman, Sumatra, recorded by Bleeker. This specimen is noted in the catalogue of the sale of Bleeker's collection in 1879 as being among those which were "trop detériorés pour pouvoir être determinés avec certitude". The young specimen from Menado, recorded by Koumans (l.c.) with a query, may be this species if Günther (l.c. 1910) and Fowler (l.c. 1928) are right in uniting *Balistes fuscolineatus* Seale (Occ. Papers B. P. Bishop Mus. I, No. 4, 1901, p. 9) with *B. radula*.

3. **Balistes vidua** Sol.

Balistes vidua Solander in Richardson, Zool. Voyage Sulphur. Fishes, 1849, p. 128.
Balistes vidua Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 565.
Balistes vidua Hollard, Ann. Sci. Nat. (4) I, 1854, p. 319.
Melichthys vidua Bleeker, Atlas Ichth. V, 1865, p. 109.
Balistes vidua Günther, Cat. Brit. Mus. VIII, 1870, p. 217.
Balistes vidua Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 409.
Balistes vidua Jordan & Seale, ibid. XXV (1905) 1906, p. 361.
Balistes vidua Günther, Fische der Südsee III, 1910, p. 438.
Balistes vidua Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 426.
Balistes vidua Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 449.
Balistes vidua Duncker & Mohr, Mitt. Zool. Mus. Hamburg 44, 1929, p. 76.
Balistes vidua Fowler, Mem. B. P. Bishop Mus. XI, No. 5, 1931, p. 364. — Proc. U. S. Nat. Mus. 81, 1932, p. 9.
Balistes vidua Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 420.
Balistes vidua Fowler, Monogr. Acad. Nat. Sci. Philadelphia 2, 1938, p. 83, p. 116, p. 131, p. 244.
Melichthys vidua J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 408.
Balistes vidua Harry, Atoll. Res. Bull. 18, 1953, p. 261.
Melichthys vidua Randall, ibid. 47, 1955, p. 218, p. 221.

D^1. III. D^2. 2.31. A. 2.27. P. 1.13. Sq. l. 65. Ltr. 36-40.

Upper profile from origin of first dorsal to tip of snout slightly convex. Height 1.78, 2.1 in length with caudal. Head 3.4, 4.1 in length with caudal. Eye 3.6, 2.77 in snout and 1.4 in convex interorbital space. A distinct slit before eye. Gill opening nearly vertical, almost one eye diameter behind vertical through hindborder of eye. Cheeks totally scaly, the scales of the head smaller than those of the body and tail. A group of enlarged scales or bony plates behind gill opening. Lips not very thick. Median teeth in jaws incisor-like, not longer than the next ones on sides. Origin of first dorsal above lower end of gill opening. Front of first dosal spine with spinules and elongate tubercles, its length 1.6 in head. Second spine four sevenths of first spine. Third spine minute, nearer to base of first spine than to origin of second dorsal. Anterior rays of second dorsal and anal longest, the length of the rays diminishing gradually to the last. Longest rays of second dorsal equal to distance between corner of mouth and gill opening, longest rays of anal shorter, equal to distance of corner of mouth from eye. Origin of anal below seventh ray of dorsal. Pectorals about equal to distance between origin of first dorsal and pupil. Ventral spine very short, covered with blunt tubercles. Caudal rounded, the lobes slightly produced in large specimens. Least depth of caudal peduncle 1.2 in its length. Scales with regular rows of small tubercles, no enlarged tubercles or spines on scales of caudal peduncle and posterior part of tail. Colour of preserved specimens chocalate brown, lips and posterior part of caudal peduncle whitish. Membrane of first dorsal brown. Pectorals, second dorsal, anal, and caudal light yellowish, the second dorsal and anal bordered anteriorly and superiorly by a narrow brown stripe, broadening posteriorly. Length 280 mm. (A specimen of Bleeker's collection in the Amsterdam Museum examined).

Habitat: Halmahera; Batjan; Ambon; Guébé; New Guinea (Manokwari); Mysore. — Durban, Delagoa Bay, Christmas Island, China, Formosa, Riu Kiu Islands, Philippines, Wake Island, Mortlock Island, Ponapé, New Britain, Solomon Islands, New Caledonia, Kingsmill Islands, Niuafoou Island, Samoa, Society Islands, Tuamotu Islands, Marquesas Islands, Hawaii.

4. **Balistes stellatus** (Lac.) Anon.

Balistes stellatus Anonymous, Allg. Lit., Zeitung III, 1798, p. 682 (Lacepède, Hist. Nat. Poissons I, 1798, p. 350).

Balistes stellaris Bloch Schneider, Syst. Ichth. 1801, p. 476.

Balistes stellatus Rüppell, Atlas Reise Nördl. Afrika. Fische, 1828, p. 31.

Balistes Vachellii Richardson, Ichthyol. Voyage Sulphur, 1844, p. 129.

Balistes phaleratus Richardson, in Stokes, Discover. Australia I, 1846, p. 484.

Balistes stellatus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 13.

Balistes forcipatus Bleeker, Acta Soc. Sci. Indo-Neerl. VI, 1859. Enumeratio piscium, p. 191 (nec Gm. L.).

Leiurus stellatus Bleeker, Atlas Ichth. V, 1865, p. 105.

Leiurus stellatus Kner, Novara Exp. Fische, 1865-1867, p. 398.
Balistes stellatus Günther, Cat. Brit. Mus. VIII, 1870, p. 212.
Balistes stellatus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 621.
Balistes stellatus Day, Fishes of India, Part IV, 1878, p. 687.
Balistes stellatus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 245.
Balistes stellatus Günther, Fische der Südsee III, 1910, p. 437.
Balistes stellaris, var. *phaleratus* McCulloch, Rec. Austr. Mus. I, 1913, p. 227.
Balistes stellatus Rendahl, Kungl. Svensk. Vetenskaps Akad. Handl. 61, No. 9, 1921, p. 23.
Abalistes stellaris Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 445.
Balistes stellatus Barnard, Ann. S. Afric. Mus. XXI, part 2, 1927, p. 951.
Abalistes stellaris Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 448.
Balistes stellatus Machan, Ann. Naturh. Mus. Wien XLIV, 1930, p. 440.
Balistes stellatus Fowler, Proc. Acad. Nat. Sci. Philadelphia 87, 1936, p. 406.
Abalistes stellatus Whitley, The Austr. Zoologist X, part 1, 1941, p. 48.
Abalistes stellatus Blegvad, Danish Inv. Iran. Part III, 1944, p. 212.
Abalistes stellaris J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 407.
Abalistes stellaris Munro, The marine and fresh water fishes of Ceylon, 1955, p. 270.

D^1. III. D^2. 2.24. A. 2.21. P. 1.13. Sq. l. 44 (+ 6 small ones on base of C).

Upper profile between base of first dorsal and tip of snout somewhat arched. Heigt 2.1, 2.4 in length with caudal. Head 3.2, 4 in length with caudal. Eye 3.4, 2.5 in snout and 1.14 in flat interorbital space. A deep, narrow slit before eye, below nostrils which are situated in a pit. Lips not very thick. Median teeth in jaws somewhat longer than next ones at the sides. Gill opening somewhat oblique, its lower end in vertical through hindborder of eye. Two larger and one smaller bony plates behind gill opening. Cheeks totally scaled. Origin of first dorsal above superior end of gill opening. First dorsal spine compressed, its anterior side covered with small spinules and tubercles, its length equal to distance between eye and corner of mouth. Second dorsal spine close to first and two thirds of its length; third spine about half length of second, slightly nearer base of second dorsal than base of first spine. Fourth or fifth rays of second dorsal longest, slightly shorter than second dorsal spine; last dorsal ray half as long as longest ray. Anal similar to soft dorsal, its origin below that of soft dorsal. Upper pectoral rays longest, as long as second dorsal spine, lower most ray half as long. Ventral spine movable, sometimes immovable, covered with tubercles and spinules, a few bifid spines at its end. Posterior margin of caudal somewhat wavy, the upper and lower rays produced, much so in large specimens. Caudal peduncle almost cylindrical, as deep as broad, its depth 3 in its length. Scales covered with regular longitudinal rows of pointed tubercles which are more crowded on head than on body and tail. Three longitudinal rows of scales on posterior part of tail and on caudal peduncle each with a more or less serrated ridge, apparently formed by coalescence of the tubercles. Colour variable, darker above, lighter below. Three milky white blotches on back, one below first dorsal spine, the second below interspace between third spine and origin of second dorsal, the third below middle of second dorsal, generally distinct in preserved specimens. In very young specimens these blotches are comparatively larger and very conspicuous, the back and the greater part of the membrane of the first dorsal being black. In life the head of large specimens is decorated with light blue bands; back with light blue spots, scales of sides of body and tail with a light blue hue. Second dorsal and anal with longitudinal dark bands. Ventral spine and ventral flap white. Length 740 mm.

Habitat: Singapore; Sumatra (Padang, Palembang); Nias; Java (Jakarta!); Celebes (Makassar); Flores; Ternate; Obi major!; Buru; Ambon. — Coast of Africa as far south as Mossel Bay, Mozambique, Zanzibar, Mauritius, Red Sea, Gulf of Iran, Maldive Area, coasts of India, Ceylon, Andamans, China, Philippines, W. and N. E. Australia, New Ireland, Louisade Archipelago, Fiji.

5. **Balistes viridescens** Bl. Schn.

Balistes viridescens Bloch Schneider, Syst. Ichth. 1801, p. 477.
Balistes viridescens Rüppell, Atlas Reise N. Afrika, Fische, 1828, p. 30.
Balistes viridescens Bleeker, Nat. Tijdschr. Ned. Indië VII, 1854, p. 374.
Balistes (Pseudobalistes) viridescens Bleeker, Atlas Ichth. V, 1865, p. 112.
Balistes viridescens Günther, Cat. Brit. Mus. VIII, 1870, p. 220.
Balistes viridescens Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 625.
Balistes viridescens Day, Fishes of India, Part IV, 1878, p. 689.
Balistes viridescens Günther, Fische der Südsee III, 1910, p. 441.
Balistes viridescens M. Weber, Siboga Exp. Fische, 1913, p. 574.
Balistes viridescens Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 431.
Balistes viridescens Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 451.
Balistoides viridescens Fraser-Brunner, Ann. Mag. Nat. Hist. (10) XV, 1935, p. 662.
Balistes viridescens Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 421.
Balistoides viridescens J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress., 1950, p. 408.
Balistoides viridescens Randall, Atoll Res. Bull. 47, 1955, p. 219, p. 222.
Balistoides viridescens Munro, The marine and fresh water fishes of Ceylon, 1955, p. 271.

D^1. III. D^2. 2.23-24. A. 2.21-23. P. 1.13. Sq. l. 30-33. Ltr. 18-20.

Upper profile from origin of first dorsal to tip of snout slightly convex. Height 1.7-1.9, 2.1-2.2 in length with caudal. Head 2.9, 3.4-

3.5 in length with caudal. Eye 3.8-4.16, 2.9-3.1 in snout and 1.3-1.5 in the convex interorbital space. A well developed slit before eye. Gill opening slightly oblique, its lower end below hindborder of eye. A few bony plates behind gill opening, not much larger than the scales of the body. Cheeks totally scaled. Chin naked. Lips rather thick. Median teeth in the jaws pointed, longer than the next ones on sides. Origin of first dorsal above upper end of gill opening. First dorsal spine compressed, its anterior side covered with tubercles and spinules, its length equal to the base of the first dorsal. Second dorsal spine half as long as first spine, or somewhat longer; third spine about half as long as second spine. Second dorsal somewhat rounded, the longest ray slightly shorter than first dorsal spine. Anal similar to second dorsal, but slightly less deep and its base shorter; its origin below 5th dorsal ray. Upper pectoral rays longest, as long as longest dorsal rays; lower most ray half as long as longest pectoral ray. Ventral spine movable, short, covered with tubercles and short, blunt spinules. Caudal rounded. Caudal peduncle longer than deep. Scales with regular rows of small, rounded tubercles. Four or five longitudinal rows of short, antrorse spines on caudal peduncle and on posterior part of tail. Colour of preserved specimens reddish brown. Scales of body and tail each with a darker bown spot. A broad brown band connecting eyes over interorbital space, continued below eye over gill opening to base of pectorals. Lips and surroundings of mouth dark brown. Membrane of first dorsal with brown spots and stripes. Outer part of caudal with brown vermiculations. Second dorsal and anal light reddish brown. Length 750 mm.

Habitat: Pulu Weh!; Nias; Java (Prigi, Tjilatjap); Borneo (Sandakan); Lombok!; Celebes (Badjoa, Tanawanko); Sulu Islands!; Batjan; Ceram!; Ambon!; Samau!; Goram; Timor; Tenimber Islands; New Guinea. — Delagoa Bay, Zanzibar, Mauritius, Red Sea, Maldives, Ceylon, Andamans, Philippines, Solomon Islands, Queensland, New Hebrides, Gilbert Islands, Fiji, Samoa.

6. **Balistes conspicillum** Bl. Schn.

Balistes niger Bonnaterre, Tabl. Encyclop. Ichthyol. 1788, p. 19 (nec Osbeck 1771 and Bloch 1787).

Balistes conspicillum Bloch Schneider, Syst. Ichth. 1801, p. 474.

Balistes conspicillum Lesson, Voyage Coquille. Zool. II, 1re partie, 1830, p. 112.

Balistes conspicillum Schlegel, Fauna Japonica, Pisces, pt. 6, 1950, p. 289.

Balistes conspicillum Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850, p. 1326 (pro parte).

Balistes conspicillum Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 780.
Balistes (*Balistapus*) *conspicillum* Bleeker, Atlas Ichth. V, 1865, p. 116.
Balistapus conspicillum Kner, Novara Exp. Fische, 1865-1867, p. 400.
Balistes conspicillum Günther, Cat. Brit. Mus. VIII, 1870, p. 220.
Balistes conspicillum Day, Fishes of India, Part IV, 1878, p. 689.
Pachynathus conspicillum Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 256.
Balistes niger Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 362 (nec Osbeck, nec Bloch).
Balistes conspicillum Günther, Fische der Südsee III, 1910, p. 441.
Balistes niger Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 427 (nec Osbeck, nec Bloch).
Balistes conspicillum Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 451.
Balistes conspicillum P. J. Schmidt, Trans. Pacific Comm. Acad. Sci. U.S.S.R. I, 1930, p. 106.
Balistes conspicillum J. L. B. Smith, Rec. Albany Mus. IV, 1935, p. 232.
Balistoides conspicillum Whitley, Mem. Queensl. Mus. XI, Part II, 1937, p. 145.
Balistoides conspicillum J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 408.

D^1. III. D. 2.23. A. 1.20. P. 1.13. Sq. l. 36 + 6. Ltr. 31.

Upper profile from origin of first dorsal to tip of snout almost straight, a very slight concavity on snout. Height 2, 2.3 in length with caudal. Head 3.2, 3.7 in length with caudal. Eye 4.46, 3.46 in snout and 1.7 in almost flat interorbital space. Gill opening slightly oblique, its lower end in vertical through hindborder of eye. A group of enlarged scales or rounded bony plates behind gill opening. Cheeks totally covered with scales which are much smaller than those of sides of body and tail. A groove before the eye. Lips thick. Origin of first dorsal almost one eye diameter behind vertical through hindborder of eye. First dorsal spine depressed, its broad anterior side covered with crowded spinules, its length about two thirds of snout. Second dorsal spine three fifths of first spine. Third spine one third of second spine, its origin at equal distances from first spine and origin of second dorsal. Longest rays of second dorsal and of anal about as long as second dorsal spine. Origin of anal below fifth dorsal ray. Upper rays of pectoral longest, longer than dorsal rays. Ventral spine short, movable, covered with blunt spines. Caudal rounded. Least depth of caudal peduncle 1.4 in its length. Scales covered with rather regular rows of tubercles. Three longitudinal rows of antrorse spines on caudal peduncle and on posterior part of tail, the median one longest, of about 10 spines, the upper one of about 4 spines on tail only, the lower one on caudal peduncle and tail, almost as long as the median one. A row of two spines may be present above the upper one. Colour of preserved specimens brown, lighter below and on back from behind eye to origin of second dorsal, the scales of this part with a darker centre. A broad, somewhat darker brown band connecting eyes over interorbital space. A chalky white band from below anterior border of eye to middle of snout, where it meets that of the other side. Lips white. A narrow white line encircling the mouth at some distance from the lips. Posterior part of chin, throat, and lower parts of cheeks to base of gill opening and base of pectoral chalky white, with some brown spots which grow larger posteriorly, surrounding large, white, rounded blotches; the brown interspaces between these blotches growing wider posteriorly, hence the sides and belly brown with longitudinal rows of white blotches, much larger than eye; three of these rows between pectoral and caudal peduncle; a row of five below these and some more on belly and along base of anal, where the blotches are smaller and elongate. Caudal peduncle chalky white, the bases of the spines dark brown. First dorsal dark brown, basal part of membrane between first and second dorsal spines light. Second dorsal and anal light brown, a narrow basal light longitudinal band, apparently red in life. Caudal light brownish with a broad dark brown terminal band. Length 500 mm.

Habitat: Singapore; Natuna Islands; Celebes (Makassar); Solor; Timor; Ambon; New Guinea. — Delagoa Bay, Madagascar, Mauritius, Réunion, coast of India, Nicobars, Formosa, Riu Kiu Islands, Japan, China, Philippines, Marshall Islands, Carolines, New Ireland, Solomon Islands, Queensland, New Hebrides, Fiji.

7. **Balistes fraenatus** Latr.

Balistes fraenatus Latreille, Nouv. Dict. Hist. Nat. ed. I. XXIV, March 1804. Poissons p. 74.

Balistes capistratus Shaw, Gen. Zool. V, November 1804, p. 417.

Balistes mitis Bennett, Proc. Comm. Zool. Soc. London I, 1831, p. 169.

Balistes amboinensis Gray, Illustr. Indian Zool. 1834.

Balistes hihpe Richardson, Voyage Sulphur, Fishes, 1843, p. 127.

Balistes frenatus Richardson, ibid. p. 129.

Balistes Schmittii Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 37. — Nat. Tijdschr. Ned. Indië V, 1853, p. 532.

Balistes frenatus Bleeker, Acta Soc. Sci. Indo-Neerl. I, 1856. Beschr. vischsoorten Manado en Makassar, p. 74.

Balistes (Balistapus) frenatus Bleeker, Atlas Ichth. V, 1865, p. 114.

Balistapus frenatus Kner, Novara Exp. Fische, 1865-1867, p. 400.

Balistes mitis Günther, Cat. Brit. Mus. VIII, 1870, p. 218.

Balistes mitis Day, Fishes of India, Part IV, 1878, p. 689.

Pachynathus capistratum Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 255.

Pachynathus capistratus Waite, Rec. Austr. Mus. V, 1903, p. 38.

Balistes capistratus Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 411.
Balistes capistratus Günther, Fische der Südsee III, 1910, p. 440.
Balistes capistratus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 430.
Balistes capistratus Barnard, Ann. S. Afric. Mus. XXI, part 2, 1927, p. 952.
Balistes capistratus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 450.
Sufflamen fraenatus Whitley, Mem. Queensl. Mus. XI, Part II, 1937, p. 146. — Proc. Linn. Soc. New S. Wales LXVIII, 1943, p. 143.
Sufflamen fraenatus Fowler, Mem. B. P. Bishop Mus. XII, part 2, 1949, p. 153.
Sufflamen capistratus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 408.
Sufflamen capistratus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 271.
Sufflamen capistrata Randall, Atoll Res. Bull. 47, 1955, p. 219, p. 223.

D^1. III. D^2. 2.26-2.28. A. 2.24-2.25 or 3.23. P. 1.13-1.14. Sq. l. 50-56. Ltr. 30-33.

Upper profile from origin of first dorsal to tip of snout almost straight. Height 1.87-2, 2.18-2.4 in length with caudal. Head 2.8-3, 3.3-3.6 in length with caudal. Eye 4.1-4.9, 3.3-4.2 in snout and 1.14-1.5 in flat interorbital space. A narrow but rather deep slit before eye. Gill opening somewhat oblique, its lower end below posterior border of eye. A rather large bony plate behind gill opening and a row of about five much smaller ones immediately behind it. Cheeks totally scaly, those of middle of cheeks rectangular, the lower ones diamond shaped. Lips thick, swollen. Median teeth in the jaws longer than the next ones on sides. Teeth white. Origin of first dorsal above or slightly behind upper end of gill opening. Anterior half of first strong dorsal spine covered with small tubercles, its length slightly more than half length of snout. Second spine close to first, a little more or less than eye. Third spine minute, somewhat nearer first spine than origin of second dorsal. First dorsal depressible in a groove. Second dorsal slightly rounded, fourth and fifth rays longest, shorter than first dorsal spine and twice as long as last dorsal ray. Anal similar to, but shorter than second dorsal, its origin below fourth or fifth dorsal rays. Pectorals rounded, the upper rays longest, about as long as longest dorsal rays, more than twice as long as lower rays. Ventral spine short, movable, covered with bony tubercles. Ventral flap not much developed. Caudal truncate, the upper and lower lobes slightly produced. Least depth of caudal peduncle 1-1.26 in its length. Scales covered with regular rows of short, blunt tubercles. Most scales of tail and caudal peduncle each with a short, blunt, conical spine, these spines forming 8-10 longitudinal rows. Colour of preserved specimens brown, outer half of second dorsal and anal lighter. A horizontal white band from mouth to below posterior border of eye, the bands of both sides connected by a transverse band over chin. These bands sometimes absent. Lips white or pinkish. Length 500 mm.

Habitat: Sumatra (Padang, Siboga); Java; Celebes (Makassar, Menado); Sulu Islands; Ternate; Obi; Ambon; Flores!; Mysore; New Guinea (Manokwari). — Coasts of Natal, Mozambique, Zanzibar, Madagascar, Mauritius, Réunion, South Arabia, Muscat, Aden, India, Ceylon, China, Formosa, Riu Kiu Islands, Japan, Philippines, Queensland, Solomon Islands, Bellona reef, New Hebrides, Lord Howe Island, Gilbert Islands, Society islands, Tuamotu Islands, Marquesas Islands, Christmas Island, Hawaii.

8. **Balistes chrysopterus** Bl. Schn.

Balistes niger Mungo Park, Trans. Linn. Soc. III, 1797, p. 37 (nec Bloch, and Bonnaterra).

Balistes chrysopterus Bloch Schneider, Syst. Ichth. 1801, p. 466.

Balistes subarmatus Gray, Illustr. Indian Zool. 1830-1835, Tab. 90. fig. 3.

Balistes albicaudatus Rüppell, Neue Wirbelthiere. Fische des rothen Meeres, 1835, p. 54.

Balistes armatus Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 224. — Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 16.

Balistes (Balistapus) armatus Bleeker, Atl. Ichth. V, 1865, p. 115.

Balistes niger Günther, Cat. Brit. Mus. VIII, 1870, p. 218 (nec Osbeck, Bloch, or Bonnaterra).

Balistes niger Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 627 (nec Osbeck, Bloch, or Bonnaterra).

Balistes niger Day, Fishes of India, Part IV, 1878, p. 688 (nec Osbeck, Bloch, or Bonnaterra).

Balistes chrysopterus Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 362.

Balistes chrysopterus Jordan & Richardson, ibid. XXVII (1907) 1908, p. 272.

Balistes niger Günther, Fische der Südsee III, 1910, p. 439 (nec Osbeck, Bloch, or Bonnaterra).

Balistes chrysopterus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 429.

Balistes niger Barnard, Ann. S. Afric. Mus. XXI, part 2, 1937, p. 951 (nec Osbeck, Bloch, or Bonnaterra).

Balistes chrysopterus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 450.

Balistes niger Schmidt, Trans. Pac. Comm. Acad. Sci. U.S.S.R. I, 1930, p. 106 (nec Osbeck, Bloch, or Bonnaterra).

Balistes chrysopterus Giltay, Bull. Mus. Hist. Nat. Belg. IX, No. 14, 1933, p. 13.

Balistes chrysopterus Fowler, Proc. Acad. Nat. Sci. Philadelphia 87, 1936, p. 406.

Balistes chrysopterus Herre, Ann. Zool. Jap. 18, 1939, p. 307.

Hemibalistes chrysoptera J. L. B. Smith, The Sea Fishes of S. Africa. 2nd impress. 1950, p. 409.

Sufflamen chrysoptera Randall, Atoll Res. Bull. 47, 1955, p. 219, p. 223.
Hemibalistes chrysopterus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 271.

D^1. III. D^2. 2.24. A. 2.22. P. 1.12. Sq. l. about 50. Ltr. about 25.
Upper profile from tip of snout to origin of first dorsal almost straight, with a slight convexity above eye. Height 2, 2.4 in length with caudal. Head 3, 3.58 in length with caudal. Eye 4.8, 3.8 in the long snout. A slit before eye. Gill opening almost vertical, below hindborder of eye, a few granulated bony plates behind it. Cheeks totally scaly. Lips thick. Median teeth in the jaws not longer than the next ones on sides. Origin of first dorsal slightly behind gill opening. First dorsal spine anteriorly with longitudinal rows of tubercles which are longer and barb-like in the upper half of the spine. Length of spine twice in snout and eye. Second spine close to the first, slightly more than half length of first spine. Third spine half as long as second, its distance from first spine equal to its distance from second dorsal. First dorsal fin depressible in a groove. Second dorsal slightly rounded, the longest rays equal to distance between origin of first dorsal and middle of eye. Anal similar to, but shorter than second dorsal, its origin somewhat behind that of second dorsal. Pectorals rounded, the longest rays equal to distance between origin of first dorsal and middle of eye. Ventral spine short, movable, covered with tubercles and spinules. Ventral flap poorly developed. Caudal slightly rounded. Caudal peduncle about as long as deep. Scales covered with granules which are arranged in longitudinal rows on scales of sides and tail. Most scales of posterior half of tail and of caudal peduncle with short but strong conical spines, forming up to 9 rows on tail and 6 rows on caudal peduncle. Colour of preserved specimens brown, chin lighter. First dorsal light brown, second dorsal, anal, and pectorals light reddish hyaline, caudal brown with a broad white terminal band, the outer rays also white. A small specimen of 41 mm total length is dark brown above, sharply separated from the rest which is lighter, by a longitudinal straight line from snout, along lower border of eye to end of base of second dorsal. A faint bluish band from before gill opening downwards to vertical through middle of eye. A dark blotch below second fourth of base of second dorsal, another below last fourth. Membrane of first dorsal very dark brown, other fins as in the adult but the terminal white band of the caudal more developed. Length 160 mm.

Habitat: Singapore; Sumatra (Priaman); Nias; Java; Celebes (Balukomba, Menado); Sangi Islands; Binongka!, Sulu Islands;

Flores!; Solor; Timor; Ternate; Batjan, Obi; Ceram; Ambon!; Saparua; Banda!; Batanta; Salawatti; New Guinea (Manokwari, Moresby Bay). — Coasts of Natal, Mozambique, Johanna, Zanzibar, Madagascar, Réunion, Mauritius, Red Sea, Muscat, Maldives, India, Ceylon, China, Japan, Riu Kiu Islands, Pulu Tikus, Philippines, Pelew Islands, Rota, Ponapé, Marshall Islands, New Hannover, Duke of York Island, New Britain, Solomon Islands, Queensland, New Hebrides, Kingsmill Islands, Samoa, Tonga Islands, Society Islands.

Note. Fowler (Mem. B. P. Bishop Mus. X, 1928, p. 451) mentions *Balistes armatus* of Bleeker and of Macleay as synonyms of *Balistes ringens*. Apparently these citations have been removed by mistake by the printer from the synonymy of *B. chrysopterus* on p. 450, as *B. ringens* is an utterly different species.

9. **Balistes bursa** Bl. Schn.

Balistes bursa Bloch Schneider, Syst. Ichth. 1801, p. 476.
Balistes bursa Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 350.
Balistes (Balistapus) bursa Bleeker, Atl. Ichth. V, 1865, p. 116.
Balistes bursa Günther, Cat. Brit. Mus. VIII, 1870, p. 219.
Pachynathus bursa Jenkins, Bull. U. S. Fish. Comm. XXII (1902) 1904, p. 483.
Balistes bursa Jordan & Evermann, ibid. XXIII (1903) 1905, p. 410.
Balistes bursa Günther, Fische der Südsee III, 1910, p. 440.
Balistes bursa Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 433.
Balistes bursa Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 450.
Balistes bursa Schmidt, Trans. Pac. Comm. Acad. Sci U.S.S.R. I, 1930, p. 107.
Balistes bursa Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 420.
Balistes bursa Fowler, Monogr. Acad. Nat. Sci. Philadelphia 2, 1938, p. 83.
Hemibalistes bursa J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 409.

D^1. III. D^2. 2. 26. A. 3.23. P. 1. 12. Sq. l. 50, Ltr. 24-25.

Upper profile straight from origin of first dorsal to tip of snout. Height 1.9, 2.2 in length with caudal. Head 3, 3.5 in length with caudal. Eye 4.7, 4 in snout. A slit before eye. Gill opening slightly oblique, its inferior end below hindborder of eye. One large and several smaller granulated bony plates behind gill opening. Cheeks totally scaly, those on middle of cheeks diamond-shaped as the rest. Lips moderately thick. Median teeth in the jaws scarcely larger than the next ones at the sides. Origin of first dorsal half diameter of eye behind vertical through superior end of gill opening. First dorsal spine short but strong, its anterior half covered with small tubercles, its length half diameter of eye. Second spine close to the first, its length six tenths of that of first spine. Third spine one third of second spine, at equal distances from first dorsal spine and from origin of second dorsal. First dorsal fin depressible in a groove. Second dorsal slightly rounded, fourth and fifth rays longest, as long as first dorsal spine. Last dorsal ray three eights of longest ray. Anal similar but slightly shorter than second dorsal, its origin below third dorsal ray. Pectorals rounded, the upper rays longest and half length of snout, the last slightly more than half length of longest ray. Ventral spine short, movable, covered with tubercles. Ventral flap poorly developed. Caudal slightly rounded, almost truncate. Caudal peduncle as long as deep. Scales covered with regular rows of small tubercles. All scales of posterior part of sides and of tail each with a median, longitudinal, bony ridge, formed by more or less coalesced tubercles and hence sometimes double, these tubercles spine-like posteriorly, each ridge provided with two or three spines; on caudal peduncle and posterior part of tail one of the spines antrorse and much larger than the others. Colour of preserved specimens yellowish, a faint, brown, curved band, black in life, from lower side of eye to inferior part of base of pectoral. In life the ventral spine and the lower border of the ventral flap also dark. Fins yellowish as the body, the membrane of the first dorsal in life with black longitudinal bands. Length 166 mm.

Habitat: Java (Batu Ulo!); Celebes (Menado); Ambon; Ternate; New Guinea (Manokwari). — Delagoa Bay, Madagascar, Mauritius, Réunion, Christmas Island, Riu Kiu Islands, Philippines, Fiji, Society Islands, Taumotu Islands, Marquesas Islands, Hawaii.

Note. Several authors mention the Red Sea among the habitats of this species but I have not been able to trace on whose authority.

10. **Balistes erythrodon** Gthr

Xenodon (Balistes) niger Rüppell, Neue Wirbelthiere, Fische des rothen Meeres, 1835, p. 53. (nec Bloch, Bonnaterra et Mungo Park).
Erythrodon niger Rüppell, Verz. Samml. Senckenb. Mus. Fische, 1852, p. 34.
Xenodon niger Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 37.
Pyrodon niger Bleeker, Acta Soc. Sci. Indo-Neerl. VIII, 1860. Achtste bijdr. kennis vischfauna Sumatra, p. 64.
Erythrodon niger Bleeker, Atlas Ichth. V. 1865, p. 106.
Balistes erythrodon Günther, Cat. Brit. Mus. VIII, 1870, p. 228.
Balistes erythrodon Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 630.
Balistes erythrodon Day, Fishes of India, Part IV, 1878, p. 692.
Zenodon caeruleolorum Fowler, Journ. Acad. Nat. Sci. Philadelphia (2) XII, Part 4, 1904, p. 546.
Balistes erythrodon Günther, Fische der Südsee III, 1910, p. 447.
Odonus niger Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 448.
Odonus erythrodon Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 455.

Erythrodon niger P. J. Schmidt, Trans. Pacific Comm. Acad. Sci. U.S.S.R. I, 1930, p. 108.

Odonus erythrodon Fowler, Monogr. Acad. Nat. Sci. Philadelphia 2, 1938, p. 84.

Odonus niger J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 407.

Odonus niger Munro. The marine and fresh water fishes of Ceylon, 1955, p. 270.

D^1. III. D^2. 2.30-3.33. A. 2.26-3.28. P. 1.12-1.13. Sq. l. 26-28 and some small scales on base of caudal. Ltr. 17-20.

Upper profile of head from first dorsal to tip of snout slightly convex. Mouth somewhat superior, chin prominent. Height 1.95-2, 2.8-3.3 in length with caudal, the elongate caudal lobes included. Head 3.3-3.5, 4.9-5.2 in length with caudal. Eye 4.6-5.6, 3.3-4 in snout and 1.56-1.8 in the convex interorbital space. A well developed slit, longer than eye, in front of eye. Gill opening slightly oblique, its lower end in vertical through hindborder of eye. A few bony plates behind gill opening, smaller than scales of sides of body. Cheeks totally covered with rhombic scales. Chin scaled. Lips thin. Teeth red, the second one in the upper jaw pointed and fang-like, much longer than the others. Origin of first dorsal above upper end of gill opening. First dorsal spine compressed, its anterior surface and sides with rows of low tubercles, its length about twice in head. Second dorsal spine half length of first spine or shorter, third spine well developed, half length of second spine or shorter. Anterior rays of second dorsal longest, as long as distance between gill opening and corner of mouth, the last rays slightly more than eye. Anal similar to second dorsal but anterior rays somewhat shorter. Origin of anal below sixth dorsal ray. Pectorals rounded, the longest rays half length of snout. Ventral spine movable, covered with round or elongate low tubercles. Caudal lunate, the lobes produced into long filaments. Caudal peduncle constricted in its middle, its least depth 1.3-1.75 in its length. Scales with rows of small pointed spinules. Scales of tail and caudal peduncle each with a round, glassy tubercle. Colour of preserved specimens dark brown or black (bluish in life), the posterior border of the caudal white. Length 500 mm.

Habitat: Sumatra (Padang, Tandjong, Priaman); Celebes (Makassar, Menado); Ternate; Ceram; Ambon; Banda!; Salawatti; New Guinea (Manokwari). — East coast of S. Africa, southwards to Port Alfred, Mombassa, Zanzibar, Mauritius, Réunion, Red Sea, Muscat, coasts of India, Siam, China, Riu Kiu Islands, Philippines, Solomon Islands, Gilbert Islands, Society Islands, Marquesas Islands.

11. **Balistes undulatus** Mungo Park

Balistes undulatus Mungo Park, Trans. Linnean Soc. III, 1797, p. 37.
Balistes lineatus Bloch Schneider, Syst. Ichth. 1801, p. 466.
Balistes Lamourouxii Quoy & Gaimard, Voyage Uranie et Physicienne, Zool. 1824, p. 208.
Balistes aculeatus β viridis J. W. Bennett, Fishes Ceylon, 1830, pl. 10.
Balistes sesquilineatus Lay & E. T. Bennett, Zoology of Captain Beechey's voyage. 1839. Fishes p. 69.
Balistes Zeylanicus Lay & E. T. Bennett, l.c.
Balistes lineatus Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 260. — Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 14.
Balistes lineatus Hollard, Ann. Sci. Nat. (4) I. Zool. 1854, p. 337.
Balistes porcatus Gray, Cat. Fish. coll. Gronov. Brit. Mus. 1854, p. 32.
Balistes lineatus Montrouzier-Thiollière, Ann. Sci. phys. Soc. Agricult. Lyon (2) VIII, 1856, p. 495.
Balistes (Balistapus) lineatus Bleeker, Atlas Ichth. V, 1865, p. 118.
Balistapus lineatus Kner, Novara Exp. Fische, 1865-1867, p. 400.
Balistes undulatus Günther, Cat. Brit. Mus. VIII, 1870, p. 226.
Balistes undulatus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 629.
Balistes undulatus Day, Fishes of India, Part IV, 1878, p. 691.
Balistes undulatus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 245.
Balistes undulatus Seale, Occas. Papers B. P. Bishop Mus. I, No. 3, 1901, p. 115.
Balistapus undulatus Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 258.
Balistapus undulatus Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 363.
Balistes undulatus Günther, Fische der Südsee III, 1910, p. 446.
Balistapus lineatus Fowler & Bean, Proc. U. S. Nat. Mus. 62, 1922, Art. 2, p. 59.
Balistapus undulatus Herre, Philipp. Journ. Sci. 25. No. 4, 1924, p. 441.
Balistapus undulatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 454.
Balistapus undulatus Schmidt, Trans. Pac. Comm. Acad. Sci. U.S.S.R. I, p. 108.
Balistes (Balistapus) undulatus Tortonese, Boll. Mus. Zool. Anat. Comp. Torino XLV, 1935-1936, p. 59.
Balistapus undulatus Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 419.
Balistapus undulatus Fowler, Monogr. Acad. Nat. Sci. Philadelphia 2, 1938, p. 117, p. 131, p. 186, p. 212.
Balistapus undulatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 410.
Balistus undulatus Harry, Atoll. Res. Bull. 18, 1953, p. 161.
Balistapus undulatus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 272.
Balistapus undulatus Randall, Atoll Res. Bull. 47, 1955, p. 219, p. 223.
Balistapus undulatus Rofen, The Nat. Hist. of Renell Island 1, No. 10, 1958, p. 205.

D^1. III. D^2. 1.23-1.26 or 2.23. A. 1.21-1.23. P. 1.12. Sq. l. 41-49. Ltr. 23-27.

Profile of head almost straight, but with a slight concavity before eye. Height 1.9-2, 2.2-2.5 in length with caudal. Head 2.8-3.1, 3.4-3.5 in length with caudal. Eye 3.8-5.3, 2.6-4 in snout. No slit before eye. Cheeks totally scaly. Lips rather thick. Median teeth in upper jaw much longer than next ones at the sides. Gill opening vertical, behind it a patch of rhombic bony plates. Origin of first dorsal above or slightly behind gill opening. First dorsal spine with longitudinal rows of small, blunt tubercles in front, a few barbs posteriorly near its tip, its length equal to or shorter than snout. Second spine slender, close to the first one, about half as long as snout. Third spine shorter than second spine, its distance from second spine equal to its distance from second dorsal. Second dorsal rounded, the median rays longest, and about as long as second dorsal spine. Anal similar to second dorsal but shorter, its origin behind that of second dorsal, its end behind end of second dorsal. Pectorals rounded, the longest rays equal to distance between origin of first dorsal and middle of eye. Ventral spine movable, covered with blunt tubercles and with some spinules at its end. Ventral flap short. Caudal slightly rounded. Scales with longitudinal rows of granules, forming ridges on scales of sides. On caudal peduncle two longitudinal rows, each of 3 or 4 stout, longer or shorter antrorse spines. Length of caudal peduncle 1.3-1.6 in its least depth. Colour of fresh specimens dark with parallel more or less undulating red or yellow bands, more or less vertical on sides of head, but the lower ones which are broader, obliquely longitudinal; the lower most running from ventral flap to near corner of mouth, where it is forked, one branch running above upper lip, the other below lower lip; the next one running over snout where it joins that of the other side. In preserved specimens all these bands are white or dark and may almost disappear. The spines on caudal peduncle in a blackish blotch. Upper border of membrane of first dorsal dark reddish brown. Other fins yellowish or reddish. Length over 300 mm.

Nomen indig.: Pakol, Hajam (W. Java). Lamun lamun batu (Banjermasin).

Habitat: Nias; Batu Islands; Sumatra (Trussan, Padang, Priaman, Siboga); Java (Prigi, Palabuan, Batu Ulo!, Patjitan) Duizend Islands; Borneo (Balikpapan!, Sandakan); Bali; Celebes (Makassar!, Bulukomba, Badjoa, Menado, Kema); Muaras Reef, Celebes Sea!; Saleyer!; Sangi Islands! Sulu Islands!; Binongka!; Pater Noster Islands!; Flores; Flores Sea!; Solor; Damar!; Salibabu!; Timor; Halmahera; Ternate; Batjan; Obi; Buru; Ceram!; Ambon!; Goram; Nusa Laut!; Guébé; Weeim; Banda; Tenimber Islands; Kei islands!; Waigeu! Batanta; New Guinea (Sorong, Manokwari, Port Moresby, Ugi). — Delagoa Bay, Mossambique, Madagascar, Zanzibar, Somalia, Red Sea, coasts of India, Ceylon, Andamans, Christmas Island, China, Riu Kiu Islands, Japan, Philippines, Pelew Islands, Goram, Carolines, Marshall Islands, Queensland, St. Matthias, New Hannover, New Britain, Woodlark Island, New Ireland, Solomon Islands, Louisade Archipelago, New Hebrides, Santa Cruz Islands, Gilbert Islands, Rotuma, Fiji, Ninafou Island, Samoa, Phoenix Islands, Society Islands, Cook Islands, Tuamatu Islands, Marquesas Islands, Fanning Islands.

12. **Balistes echarpe** (Lac.) Anon. (Fig. 74, p. 278)

„Baliste écharpe" Lacepède, Hist. Nat. Poissons I, 1798, p. 333, p. 352.
Balistes echarpe Anonymous Allg. Lit. Zeit. III, 1798, p. 682.
Balistes rectangulus Bloch Schneider, Syst. Ichth. 1801, p. 465.
Balistes medinilla Quoy & Gaimard, Voyage Uranie & Physicienne, Poissons, 1824, p. 206.
Balistes erythropteron Lesson, Voyage Coquille, Zool. II, 1830, p. 123.
Balistes cinctus Bleeker, Acta Soc. Sci. Indo-Neerl. II, 1857. Achtste bijdr. kennis vischfauna Amboina, p. 96.
Balistes (Balistapus) cinctus Bleeker, Atlas Ichth. V, 1865, p. 119.
Balistes rectangulus Günther, Cat. Brit. Mus. VIII, 1870, p. 225.
Balistes rectangulus Day, Fishes of India, part IV, 1878, p. 691.
Balistapus rectangulus Seale, Occas. Papers B. P. Bishop Mus. I, 1901, p. 116.
Balistapus rectangulus Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 413.
Balistapus rectangulus Jordan & Richardson, Bull. Bur. Fish. XXVII (1907) 1908, p. 273.
Balistes rectangulus Günther, Fische der Südsee III, 1910, p. 445.
Balistapus rectangulus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 442.
Balistapus rectangulus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 453. — Monogr. Acad. Nat. Sci. Philadelphia 2, 1938, p. 244.
Rhinecanthus rectangulus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 410.
Rhinecanthus rectangulus Randall, Atoll Res. Bull. 47, 1955, p. 220, p. 225.
Rhinecanthus echarpe Whitley, The Austr. Zoologist XII, No. 4, 1959, p. 322.

D^1. III. D^2. 23 (24). A. 21. P. 1.12. Sq. l. 35 + 4 on base of caudal. Ltr. 24.

Upper profile straight from interorbital space to tip of snout. Height 2, 2.36 in length with caudal. Head 2.6, 3.06 in length with caudal. Eye 5.5, 4.7 in snout and 1.4 in scarcely convex interorbital space. No slit before eye. Gill opening almost vertical, a little more than half diameter of eye behind vertical through hindborder of eye. Four or five bony plates behind gill opening. Cheeks totally scaly, those on middle of cheeks more or less quadrangular. Teeth white, the median ones in upper jaw not longer than the next ones on sides. Origin of first dorsal above gill opening. First dorsal spine short but stout, compressed, covered with low bony ridges and tubercles, its length about equal to half length of snout; second spine about half length of first, third minute, at equal distances from first spine and from origin of second dorsal. Second dorsal low, rounded, the median rays longest and five ninths of first dorsal spine. Anal similar to but somewhat shorter and deeper than second dorsal, its longest rays seven ninths of first dorsal spine. Upper pectoral rays as long as first dorsal spine and more than twice as long as lowermost ray. Ventral spine short, covered with small tubercles. Caudal slightly rounded. Scales covered with low, blunt tubercles which are less developed on lower side of head. Scales of caudal peduncle and posterior part of tail each with a rather strong but short antrorse spine, these spines forming 4 or 5 longitudinal rows. Caudal peduncle not much deeper than broad, its depth 1.25 in its length. Colour of preserved specimens yellowish, back and sides of head darker. A broad, dark bluish brown band connecting eyes over interorbital space. A similar band from posterior half of lower border of eye to gill opening and base of pectoral, continued as a very broad band to anus and base of anal. These bands bordered above and below by a narrow bright bluish white stripe, less distinct in large specimens, the upper one from behind eye to below origin of second dorsal, where it bifurcates, one stripe following the upper margin of the dark band to base of anal, the other running to end of base of second dorsal. The lower stripe from eye to base of pectoral; another before it, parallel to it in its upper part, joining it at base of pectoral. Caudal peduncle dark brown, the dark colour produced into a triangular patch anteriorly on posterior part of tail, the top of the triangle in the median line. This triangular patch bordered by bright bluish white stripes, forming an acute angle, parallel to and inside that formed by the bifurcations mentioned above. A similar bluish white stripe along base of caudal and of pectoral. Membrane of first dorsal dark brown. Second dorsal, anal, and pectorals hyaline yellowish, caudal brownish. Length 200 mm.

Habitat: Java (Prigi); Borneo; Karekelang!; Sulu Islands; Ambon; Lucipara Islands! Rawak; Waigeu; New Guinea (Madang, Port Moresby, Ugi). — East coast of Africa as far south as Xora mouth, Mozambique, Madagascar, Mauritius, Réunion, coasts of

India, Gulf of Siam, Christmas Island, China, Philippines, Pelew Islands, Mariannas, Marshall Islands, Carolines, N. and W. Australia, New Hebrides, Norfolk Island, Gilbert Islands, Rotuma, Phoenix Islands, Samoa, Friendly Islands, Society Islands, Taumotu Islands, Marquesas Islands, Hawaii.

13. **Balistes verrucosus** L.

Balistes verrucosus Linné, Syst. Nat. ed. 10. 1758, p. 328.
Balistes cinereus Bonnaterra, Encycl. Ichth. 1788, p. 20.
Balistes verrucosus Bloch Schneider, Syst. Ichth. 1801, p. 465.
Balistes viridis Bloch Schneider, ibid. p. 476.
Balistes praslinensis Quoy & Gaimard, Voyage Uranie & Physicienne. Zool. 2e partie. 1824, p. 205.
Balistes praslinoides Lesson, Voyage Coquille. Zool. 1re partie. 1830, p. 117.
Balistes melanopleura Bleeker, Journ. Ind. Arch. III (1848) 1849, p. 71, p. 73.
Balistes praslinus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 14.
Balistes verrucosus Montrouzier Thiollière, Ann. Sci. phys. Soc. d'Agric. Lyon (2) VIII, 1857, p. 493.
?*Balistes heteracanthus* Bleeker, Acta Soc. Sci. Indo-Neerl. VI, 1859. Bijdr. kennis vischfauna N. Guinea, p. 22.
?*Balistes* (*Balistapus*) *heteracanthus* Bleeker, Atlas Ichth. V, 1865, p. 117.
Balistes (*Balistapus*) *verrucosus* Bleeker, ibid. p. 120.
Balistapus verrucosus Kner, Novara Exp. Fische I, 1865-1867, p. 399.
Balistes verrucosus Günther, Cat. Brit. Mus. VIII, 1870, p. 225.
Balistes cinereus Günther, ibid., p. 226.
Balistapus verrucosus Jordan & Richardson, Bull. Bur. Fish. XXVII (1907) 1908, p. 272.
Balistes verrucosus Günther, Fische der Südsee III, 1910, p. 444.
Balistes (*Balistapus*) (*cinereus*?) M. Weber, Siboga Exp. Fische, 1913, p. 576.
Balistapus verrucosus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 443.
Balistapus verrucosus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 454.
Balistapus verrucosus Schmidt, Bull. Acad. Leningrad, 1930, p. 557.
Balistapus verrucosus Inger. Fieldiana 36, No. 3, 1957, p. 402.

D^1. II. D^2. 2.23 or 3.22-23. A. 2.20. P. 1. 12. Sq. l. about 45, Ltr. about 22.

Profile of head from tip of snout to above eye straight, slightly more horizontal from there to base of first dorsal. Height 2-2.18, 2.4-2.9 in length with caudal. Head 2.47-3, 2.9-3.35 in length with caudal. Eye 4.2-5.7, 3.2-5.5 in the long snout. No slit before eye. Gill opening oblique, its anterior end below frontborder, or below middle of eye, its superior end below or behind hindboder of eye. A few granulated bony plates behind gill opening. Lips thick. Median teeth in the jaws scarcely longer than next ones on the sides. Cheeks totally scaly. Origin of first dorsal one eye diameter behind eye. First spine anteriorly with longitudinal rows of conical tubercles, the median rows consisting of compressed tubercles, enlarged in the upper part of the spine and here forming two rows. Length of first spine a little more than half snout. Second spine close to, and half as long as, first spine. Third spine minute, about one fourth of second spine, at equal distances from first spine and from origin of second dorsal. Anterior rays of second dorsal increasing in length to about the fourth, which is shorter than first dorsal spine but longer than second spine. Following rays only slightly decreasing in length, the upper border of the fin almost straight. Anal similar to, but shorter than second dorsal, its origin behind that of second dorsal. Pectorals rounded, the longest rays 2.3-2.6 in head. Ventral spine short, movable, covered with tubercles and spinules. Ventral flap poorly developed. Caudal truncate or slightly rounded. Scales covered with granules, those on sides of body and tail somewhat larger and with irregular rows of somewhat elongate granules. Posterior part of tail and the caudal peduncle with three longitudinal rows of short but stout antrorse spines. Least depth of caudal peduncle 1.1-1.5 in its length. Colour of preserved specimens brown, somewhat lighter below. A large dark brown patch covering sides above anus and anterior part of anal, reaching to middle of sides. A dark, often rather narrow saddle on caudal peduncle. A light bluish band encircling the mouth and continued on each side as a tapering band to base of pectorals or not so far. A dark band connecting the eyes and continued downwards as a tapering band to base of pectorals. This band bordered anteriorly and posteriorly by light bluish stripes. Two similar stripes connecting the eyes over the interorbital space and a similar stripe from lower border of eye to base of pectoral. Fins yellowish, first dorsal dark at base. Length 225 mm.

Habitat: Sumatra (Tandjong, Trussan, Padang, Ulakan, Priaman); Nias; Java (Prigi, Patjitan); Bali; Postillion Islands; Borneo (Pulo Bakkungaan Kechil) Celebes (Makassar !, Dongala ?, Badjoa, Menado, Tombariri); Saleyer !; Sangi Islands; Siau !; Solor, Rotti !; Timor; Ternate; Batjan; Obi; Buru; Ceram; Ambon !; Lucipara Islands !; Goram; Guébé; Banda !; Tiur !; Kei Islands !; Aru Islands; Weerin near Misol; Batanta; Waigeu !; Mysore; New Guinea (Manokwari, Moresby Bay, Fr. Wilhelmshafen). — Mauritius, China, Riu Kiu Islands, Philippines, Pelew Islands, St. Matthias, New Ireland, New Britain, Duke of York Island, Woodlark Island, Solomon Islands, Society Islands.

Note. Bleeker described *Balistes heteracanthus* after young specimens of 28-31 mm long. He thought it not impossible that they are the young of *B. cinereus*. Günther (Cat. Brit. Mus. VIII, 1870, p. 211, footnote) is of the same opinion. Similar young specimens have been recorder by M. Weber (l.c.) and by Duncker & Mohr (Mit. Zool. Museum Hamburg 44, 1929, p. 76).

14. **Balistes aculeatus** L.

Balistes aculeatus Linné, Syst. Nat. ed. 10. 1758, p. 328.
Balistes aculeatus Bloch, Naturgesch. Ausländ. Fische II, 1786, p. 19.
Balistes ornatissimus Lesson, Voyage Coquille. Zool. II. 1re partie, 1830, p. 119.
Balistes aculeatus Bleeker, Journ. Ind. Arch. II, 1848, p. 638. — Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 15.
Balistes (Balistapus) aculeatus Bleeker, Atlas Ichth. V, 1865, p. 120.
Balistapus aculeatus Kner, Novara Exp. Fische I, 1865-1867, p. 399.
Balistes aculeatus Günther, Cat. Brit. Mus. VIII, 1870, p. 223.
Monacanthus Cheverti Alleyne & Macleay, Proc. Linn. Soc. New S. Wales II, 1877, p. 69.
Balistes aculeatus Day, Fishes of India, Part IV, 1878, p. 690.
Balistapus aculeatus Seale, Occas. Papers B. P. Bishop Mus. I, 1901, p. 115.
Balistapus aculeatus Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 259.
Balistapus aculeatus Fowler, Proc. Acad. Nat. Sci. Philadelphia LV, 1903, p. 162.
Balistapus aculeatus Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 414.
Balistapus aculeatus Jordan & Richardson, ibid. XXVII (1907) 1908, p. 272.
Balistes aculeatus Günther, Fische der Südsee III, 1910, p. 443.
Balistes (Balistapus) aculeatus M. Weber, Siboga Exp. Fische, 1913, p. 576.
Balistapus aculeatus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 440.
Balistapus aculeatus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 953.
Balistapus aculeatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 452. — ibid. XI, No. 5, 1931, p. 365.
Balistapus (Rhinecanthus) aculeatus Whitley, Great Barrier Reef Exp. Sc. Rep. British Mus. IV, No. 9, 1932, p. 310.
Balistes (Balistapus) aculeatus Tortonese, Boll. Mus. Zool. Univ. Torino (3) XLV, 1935-1936, p. 57.
Balistapus aculeatus Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 417.
Rhinecanthus aculeatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 410.
Rhinecanthus aculeatus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 272.
Rhinecanthus aculeatus Randall, Atoll Res. Bull. 47, 1955, p. 220, p. 225.
Rhinecanthus aculeatus Rofen, The Nat. Hist. of Rennell island I, No. 10, 1958, p. 205.

D^1. III. D^2. 2.22. A. 2.20. P. 1.12. Sq. l. 36 (31 + 5). Ltr. 20.

Upper profile almost straight from origin of dorsal to tip of snout. Height 2.3, 2.6 in length with caudal. Head 2.76, 3.1 in length with caudal. Eye 5.5, 4.7 in snout and 1.6 in nearly flat interorbital space. Gill opening oblique, its lower end in vertical through hindborder of eye. A group of large bony plates behind gill opening. Cheeks entirely scaly, the scales rhombic and somewhat smaller than those of body and tail. No slit before eye. Lips thick. Median teeth in jaws not longer than the others. Origin of first dorsal half diameter of eye behind vertical through hindborder of eye. First dorsal spine compressed, its anterior side with rows of coarse, blunt spinules, its length about half length of snout. Second spine half as long as first, third spine minute. Second dorsal and anal slightly rounded, the anterior rays longest, following rays gradually decreasing in length to the last. Longest dorsal rays about as long as first dorsal spine, last dorsal ray half as long. Anal slightly less deep than dorsal, its origin somewhat behind that of dorsal. Pectorals 2.6 in head. Ventral spine movable, covered with tubercles and with some strong spinules at its free end. Caudal rounded. Least depth of caudal peduncle 1.5 in its length. Scales covered with regular rows of rounded tubercles. Three longitudinal rows of strong antrorse spines on scales of caudal peduncle and posterior half of tail, the middle and upper ones consisting of 8-11 spines, the lower one, only developed on caudal peduncle, of 2-6 spines. Colour of preserved specimens brown. A very broad dark brown band from gill opening obliquely backwards and upwards, bifurcating below base of second dorsal, one branch to anterior and the other to the posterior base of that fin. Five narrower bands to base of anal, the bands separated by chalky or light bluish bands, running obliquely downwards from middle of sides to base of anal. Interorbital space bluish with three brown bands connecting eyes, the outer ones margined with a narrow white band, these two white bands prolonged below eye and meeting at base of pectoral, as well as with a third white band between them which runs from lower border of eye downwards. A white band over snout immediately behind upper lip, deflected at corner of mouth and running to below base of pectoral. Fins yellowish. Length 300 mm.

Habitat: Sumatra (Priaman); Nias; Java (Jakarata); Borneo; Borneo Bank!; Celebes (Makassar!, Menado, Tanawanko, Tombariri); Sulu Islands!; Sangi Islands; Talaud Islands!; Siau!; Binongka!; Sumbawa; Flores!; Solor!; Rotti!; Tenimber Islands; Timor; Lucipara Islands!; Buru; Ternate; Haruko; Saparua; Ceram; Goram; Banda; Weeim Island near Misol; Saonek Island near Waigeu!; Batanta; New Guinea (Manokwari, Port Moresby). — West Africa?, east coast of Africa from Port Alfred eastwards, Mozambique, Madagascar, Seychelles, Mauritius, Réunion, Zanzibar, Red Sea, Maldives, Chago Archipelago, coasts of India, Ceylon, Siam, Andamans, China, Japan, Riu Kiu Islands, Philippines, Pelew

Islands, Marcus Island, Saypan, Guam, Carolines, New Ireland, Solomon Islands, Torres Straits, North Queensland, New South Wales, Santa Cruz Islands, New Hebrides, New Caledonia, Gilbert Islands, Ellice Island, Funafuti, Rotuma, Fiji, Phoenix Islands, Tonga Islands, Samoa, Society Islands, Taumotu Islands, Palmyra Island, Johnston Island, Hawaii.

15. **Balites fuscus** Bl. Schn.

Balistes fuscus Bloch Schneider, Syst. Ichth. 1801, p. 471.
Balistes chrysospilos Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 94.
Balistes reticulatus Hollard, Ann. Sci. Nat. 1, 1854, p. 312.
Balistes (Parabalistes) chrysospilus Bleeker, Atlas Ichth. V, 1865, p. 111.
Balistes fuscus Günther, Cat. Brit. Mus. VIII, 1870, p. 222.
Balistes fuscus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 623.
Balistes fuscus Day, Fishes of India, Part IV, 1878, p. 690.
Balistes fuscus Waite, Mem. Austr. Mus. III, 1899, p. 196.
Balistes fuscus Seale, Occas. Papers B. P. Bishop Mus. IV, No. 1, 1906, p. 73.
Balistes fuscus Günther, Fische der Südsee III, 1910, p. 442.
Balistes fuscus Snyder, Proc. U. S. Nat. Mus. 42, 1912, p. 511.
Balistes fuscus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 435.
?*Balistes fuscus* Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 451. Pl. XLV C.
Balistes fuscus Tortonese, Boll. Mus. Zool. Anat. comp. Univ. Torino XLV, 1935/1936, p. 57.
Xantichthys fuscus Fowler, Mem. B. P. Bishop Mus. XII. 2. 1949, p. 154.
Pseudobalistes fuscus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 410.
Pseudobalistes fuscus Randall, Atoll Res. Bull. 47, 1955, p. 219, p. 221.
Pseudobalistes fuscus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 270.

D^1. III. D^2. 2.23. A. 2.21. P. 1.12 or 1.12.1. Sq. l. 34-45. Ltr. 24-34.

Profile of head arched. Height, measured between origins of second dorsal and anal, 1.8-1.98, 2.33 in length with caudal. Head 2.8-2.87, 3.37-3.6 in length with caudal. Eye 3.6-3.72, 2.66-2.79 in snout and 1.03-1.09 in slightly convex interorbital space. A very shallow groove before eye. Anterior part of cheeks and surrounding of mouth naked, lower posterior part of cheeks with horizontal rows of small scales, separated by naked interspaces. Lips somewhat fleshhy. Median teeth in jaws pointed, longer than next ones on sides, yellowish. Two bony plates behind gill opening, which is slightly oblique, the lower end below hindborder of eye. Origin of first dorsal above upper end of gill opening. First dorsal spine compressed, its anterior surface with rows of blunt tubercles, the sides smooth. Second spine less than half length of first, third spine seven tenths of second spine. Dorsal and anal elevated, rounded, the longest rays in anterior part of the fin, those of dorsal 1.54-1.58, those of anal 1.57-2 in head. Origin of anal slightly behind that of dorsal. Pectorals rounded, the upper rays longest, 2.37-2.4 in head. Ventral flap rather poorly developed. Ventral spine movable, covered with tubercles and spinules. Caudal truncate in young, lunate in older specimens, with the lobes more or less produced. Least depth of caudal peduncle 1-1.2 in its length. Scales with rows of blunt tubercles, those of lower side of head much smaller than those of body and tail. No spines or scales on tail and caudal peduncle. Colour of preserved specimens variable. In a specimen of 107 mm standard length: Brown with longitudinal rows of yellow dots on body and tail and on posterior half of head. Second dorsal and anal with rows of larger light dots, less distinct on caudal. In a specimen of 155 mm standard length the rows of spots have fused and the fish is yellow with brown longitudinal bands, recurved below base of second dorsal, more or less anastomising on head. Second dorsal and anal light with similar longitudinal brown bands, often forming rows of circles, or rows of dark spots. Caudal light with vertical rows of dark spots. Pectorals with indistinct bands. In very large specimens the colour is said to be uniform. Length 529 mm. (Typical specimens of *B. chrysospilus* of Bleeker's collection in the Leiden Museum examined).

Habitat: Solor!; Celebes (Makassar!); New Guinea. — East coast of Africa as far south as Durban and Delagoa Bay, Zanzibar, Réunion, Mauritius, Red Sea, coasts of India, Ceylon, Formosa, Riu Kiu Islands, Philippines, Ponapé, Queensland, New Hebrides, Kingsmill Islands, Ellice Islands, Fiji, Society Islands, Hawaii, Tuamotu Archipelago.

Note. I am not quite sure that the fish, shortly described by Fowler (l.c. 1928) as *B. fuscus,* is that species as the figure, made after a photograph, shows the cheeks scaly and the groove before the eye much more pronounced than in specimens of *fuscus* seen by me.

16. **Balistes flavimarginatus** Rüpp.

?*Balistes Brasiliensis* Bloch, Schneider, Syst. Ichth. 1801, p. 470[1]).

Balistes flavimarginatus Rüppell, Atlas Reise N. Afrika, 1828, p. 33. — Neue Wirbelthiere. Fische des rothen Meeres, 1835, p. 54.

Balistes flavimarginatus Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 303.

Balistes Beeri Bleeker, Acta Soc. Sci. Indo-Neerl. VIII, 1860. Dertiende Bijdr. kennis vischfauna Celebes, p. 53.

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1) See Günther, Cat. Brit. Mus. VIII, 1870, p. 517 and Jordan & Seale, 1906, l.c.

Balistes (Pseudobalistes) flavomarginatus Bleeker, Atl. Ichth. V, 1865, p. 113.
Balistes flavimarginatus Günther, Cat. Brit. Mus. VIII, 1870, p. 223.
Balistes flavimarginatus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 626.
Balistes flavimarginatus Day, Fishes of India, Part IV, 1878, p. 690.
Balistes papuensis Macleay, Proc. Linn. Soc. New S. Wales VIII, 1883, p. 279.
Balistes flavomarginatus Waite, Mem. Austr. Mus. III, 1899, p. 197.
Pseudobalistes flavimarginatus Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 257.
Balistes flavomarginatus Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 362.
Balistes flavimarginatus Evermann & Seale, ibid. XXVI (1906) 1907, p. 99.
Balistes flavimarginatus Jordan & Richardson, ibid. XXVII (1907) 1908, p. 272.
Balistes flavomarginatus Günther, Fische der Südsee III, 1910, p. 443.
Balistes flavimarginatus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 438.
Balistes flavimarginatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 452. — Proc. Acad. Nat. Sci. Philadelphia 86, 1934, p. 510.
Balistes papuensis Seale, Proc. Calif. Acad. Sci. (4) 21, 1935, p. 375.
Balistes flavimarginatus Tortonese, Boll. Mus. Zool. Anat. Comp. Torino XLV, 1935-1936, p. 56.
Balistes flavimarginatus Fowler, Monogr. Acad. Nat. Sci. Philadelphia 2, 1938, p. 116, p. 155.
Rhinecanthus papuensis Fowler, Mem. B. P. Bishop Mus. XII, 2, 1949, p. 154.
Pseudobalistes flavomarginatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 409.

D^1. III. D^2. 2.24.1. A. 2.21.1. P. 1.13.1 Sq. l. 30-32. Ltr. 18-22.

Profile of head convex. Height 1.9-2, 2.18-2.5 in length with caudal. Head 2.96-3.1, 3.38-3.8 in length with caudal. Eye 4-5.5.7, 2.85-4.47 in snout. A short groove before eye. Cheeks covered with longitudinal rows of scales in young, anteriorly gradually disappearing in old specimens. Lips fleshy. Median teeth in the jaws more or less longer than the next ones on the sides. Bony tubercles behind gill opening which is slightly oblique, its lower end in vertical through hindborder of eye. Origin of first dorsal above superior end of gill opening. First dorsal spines covered anteriorly with conical tubercles which are longer near the tip of the spine and barb-like in young specimens, often with two points. Length of first spine equal to snout in young, 1.4 in snout in older specimens. Second dorsal spine close to first one, and about half as long. Third dorsal spine shorter than second, its base slightly nearer base of second spine than origin of second dorsal. Second dorsal rounded, the longest rays as long as or longer than first dorsal spine. Anal similar to second dorsal, but shorter, its origin behind that of second dorsal, its end below that of second dorsal. Caudal rounded in young, truncate in older specimens and deeply lunate with prolonged marginal lobes in very large specimens. Pectorals rounded, the longest rays equal to distance between origin of first dorsal and middle of eye. Ventral spine movable, covered with tubercles and spinules. Ventral flap moderately developed. Scales large, smaller on anterior and lower parts of head and along the bases of the vertical fins. Each scale covered with granules. Scales of caudal peduncle each with a conical spine, these spines forming 5 or 6 longitudinal rows. Least depth of caudal peduncle 1-1.3 in its length. Colour of preserved specimens brownish, each scale of sides with a brown spot. Membrane of first dorsal dark in its basal half. Vertical fins light yellowish, their basal half brownish. Length 600 mm.

Habitat: Bawean; Borneo; Celebes (Makassar!, Badjoa, Menado); Sulu Islands!; Buton Straits!; Siau!; Ternate; Batjan; Ceram; Ambon; Banda!; Waigeu; Mysore; New Guinea (Musinama, Hood Bay). — Zululand, Delagoa Bay, Mozambique, Mauritius, Red Sea, Andamans, Riu Kiu Islands, Japan, Philippines, New Britain, Solomon Islands, Funafuti, Samoa, Society Islands, Taumotu Islands.

17. **Balistes ringens** L.

Balistes ringens Linné, Syst. Nat. ed. 10. 1758, p. 329.
Balistes aureolus Richardson, Voyage Sulphur. Ichthyol. 1844-1845, p. 126.
Balistes notatus Gronovius, Gray, Syst. Ichthyol. 1854, p. 221.
Balistes lineo-punctatus Hollard, Ann. Sci. Nat. (4) I, 1854, p. 65.
Balistes (Parabalistes?) notatus Bleeker, Atlas Ichth. V, 1865, p. 112.
Balistes aureolus Günther, Cat. Brit. Mus. VIII, 1870, p. 215.
Balistes ringens Günther, ibid. p. 221.
Xanthichthys lineopunctatus Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 416.
Xanthichthys lineopunctatus Jordan & Seale, ibid. XXV (1905) 1906, p. 363.
Balistes ringens Günther, Fische der Südsee III, 1910, p. 441.
Canthidermis ringens Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 954.
Balistes ringens Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 451.
Xanthichthys ringens J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 409.
Xanthichthys ringens Randall, Atoll Res. Bull. 47, 1955, p. 218, p. 220.

D^1. III. D^2. 29. A. 27-28. Sq. l. 37-38. Ltr. 18-23.

No osseous plates behind gill opening. A groove before the eye. Scales on cheeks larger than those on body, rectangular, in longitudinal rows separated by narrow dark coloured grooves. Chin prominent. First dorsal spine well behind eye, over gill opening, 2 in head. Third spine minute. Second dorsal and anal concave, the anterior rays longest. Caudal lunate. Scales of posterior part of tail with small tubercles, forming low longitudinal ridges. Each scale with a dark spot forming lines on sides. Length 300 mm. (Compiled, not seen by me).

Habitat: Indo-Australian Archipelago?. — Durban, Mauritius, Réunion, Nauru, Fiji, Samoa, Hawaii, Easter Island, Pacific and Atlantic tropical coasts of America.

Note. No specimens are known from the Indo-Australian Archipelago. Bleeker (l.c.) thought that Valentyn's and Renard's figures of a fish from the Moluccas they call "Kandawour" could be referred to *B. notatus* (= *B. ringens*), but these figures do not show any of the characteristics of this species. Günther (1870, l.c.) gives as habitat of *aureolus*: "East Indies?", but in 1910 (l.c.) where he united *aureolus* with *ringens,* he said that the typical specimen of *aureolus* probably came from the western coast of Central America. There is a great gap in the distribution of *B. ringens* between Mauritius and Réunion in the west and Nauru in the east, but it remains possible that it still will be found in the eastern part of the Indic and the western part of the tropical Pacific.

As I have not examined specimens of this species I leave it undecided if *ringens* L and *lineopunctatus* Hollard are different species.

18. **Balistes rotundatus** Procé.

Balistes rotundatus Procé, Bull. Soc. Philom. 1822, p. 130.
Balistes azureus Lesson, Voyage Coquille. Zool. II, 1re Partie, 1830, p. 121.
Balistes oculatus Gray, Illustr. Ind. Zool. Fish. 1832, pl. VIII, fig. 1.
Balistes senticosus Richardson, Zool. Voyage Samarang, Fishes, 1848, p. 23.
Balistes conspicillum Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850, p. 1326 (pro parte).
Balistes senticosus Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 93.
Balistes brevissimus Hollard, Ann. Sci. Nat. (4) I, 1854, p. 56.
Balistes (Canthidermis) oculatus Bleeker, Atlas Ichth. V, 1865, p. 121.
Balistes (Canthidermis) maculatus Bleeker, ibid. p. 122 (nec Bl.?).
Balistes maculatus Günther, Cat. Brit. Mus. VIII, 1870, p. 213 (nec Bl.?).
Balistes maculatus Day, Fishes of India, part IV, 1878, p. 687 (nec Bl.?).
Canthidermis rotundatus Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 260.
Canthidermis angulosus Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 415.
Canthidermis rotundatus Smith & Pope, Proc. U. S. Nat. Mus. XXXI, 1906, p. 481.
Canthidermis angulosus Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 363.
Balistes senticosus Günther, Fische der Südsee III, 1910, p. 437.
Balistes oculatus Günther, ibid. p. 438.

Canthidermis rotundatus Tanaka, Figures and Descr. Fishes of Japan II, 1911, p. 20.

Canthidermis rotundatus Snyder, Proc. U. S. Nat. Mus. 42, 1912, p. 423.

Balistes (Canthidermis) rotundatus M. Weber, Siboga Exp. Fische, 1913, p. 577.

Canthidermis rotundatus E. K. Jordan, Proc. U. S. Nat. Mus. 66, Art 33, 1925, p. 39.

Canthidermis viola Herre, Philipp. Journ. Sci. 31, No. 4, 1926, p. 534.

Canthidermis maculatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 448 (nec Bl.?).

Canthidermis rotundatus Fowler, ibid. p. 449.

Balistes oculatus Duncker & Mohr, Mitt. Zool. Mus. Hamburg 44, 1929, p. 76.

Canthidermis rotundatus Fowler, Monogr. Acad. Nat. Sci. Philadephia 2, 1938, p. 208.

Canthidermis maculatus Schultz, U. S. Nat. Mus. Bull. 180, 1943, p. 291.

Canthidermis maculatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 409.

Canthidermis rotundatus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 271.

D^1. III. D^2. 2.23-24. A. 1-2.21. P. 1.14. Sq. l. 42-43. Ltr. 29-34.

Upper profile from origin of dorsal to tip of snout slightly convex. Height in small specimens 1.7-1.9, 2-2.3 in length with caudal. Large specimens are more elongate. Head in small specimens 2.6-2.87, 3-3.4 in length with caudal. Eye in small specimens 3.2-3.5, 1.6-2 in snout, 1.3-1.5 in interorbital space. A groove before eye. Gill opening almost vertical, at least one eye diameter behind vertical through hindborder of eye. No enlarged scales or bony plates behind gill opening. Cheeks totally scaled. Origin of first dorsal above gill opening. First dorsal spine anteriorly with two ridges, enclosing a median groove, running from its base to its tip; the ridges provided with rather strong spinules; laterally a row of shorter spinules. Length of first spine slightly less than snout in small specimens, more than twice in snout in large specimens. Second dorsal spine one half or more than one half of first spine; third spine more than one half of second spine, comparatively shorter in large specimens. In young specimens the third spine is at equal distances from first spine and origin of second dorsal, in adults much nearer first spine. Origin of second dorsal at equal distances from eye and from base of caudal, in large specimens slightly nearer eye. Second dorsal and anal deep. In young specimens the longest, median rays are as long as snout, in somewhat larger specimens they are longer than snout. In adults these fins are pointed, the anterior rays being longest and the free border of the fins concave. Upper pectoral rays slightly less than length of first dorsal spine, lowermost ray about half as long. Ventral spine short, immovable, covered with spinules. Caudal rounded in young, in large specimens the upper and lower lobes slightly produced. In small specimens the caudal peduncle is as deep as long, in large specimens much longer than deep. In young specimens the scales of the head have several low spinules, those of sides of body and tail each have a rather large spine, with ridges radiating from its base; some of these ridges bear small spinules. The spines on the scales of the caudal peduncle are not larger than those on the scales of body and tail, the largest are on the scales bordering the groove of the first dorsal and along the ventral flap. In large specimens the scales apparently have no spines but only a median ridge. Colour of preserved young specimens light brown with dark brown interrupted longitudinal stripes on head, body, and tail, dissolved into spots at bases of second dorsal, anal, and caudal. Some parallel oblique stripes on cheeks. In life small specimens have white spots, scattered on head, body, tail, and basal parts of second dorsal, anal, and caudal. In large specimens the colour is either uniform, or with large, rounded, light blotches on head, body, tail, and basal parts of second dorsal, anal, and caudal. Length 400 mm.

Habitat: Singapore; Banka; Borneo; Sapeh Strait!; Solor; Sumba; Samau!; Arafura Sea!; Batjan; Guébé; New Guinea. — Cape of Good Hope, east coast of Africa, Zanzibar, Mauritius, Réunion, coasts of India, Ceylon, Siam, Malay Peninsula, Pulu Condor, China, Formosa, Korea, Riu Kiu Islands, Japan, Philippines, Pelew Islands, Yap, Ponapé, Admirality Islands, Australia, Samoa, Laysan, Hawaii, Christmas Island, Galapagos Islands. In sea, young specimens often pelagic.

Note. It is still uncertain if *maculatus* and *rotundatus* are different species, or that the latter is the young stage of the former. I leave out the question if the Indo-Pacific *maculatus* is the same as the Atlantic one. The description given above is made after small specimens, agreeing with the descriptions of *rotundatus, oculatus,* and *senticosus.* I agree with Fowler (1928) that the separation of *oculatus* and *senticosus* by Günther (1910) is based on feeble ground. Another question is if *Balistes maculatus* as described by Bleeker and other authors is a synonym of *rotundatus.* I shall leave out the question if *B. maculatus* of Bloch, whose type came from the West Indies, is the same as Bleeker's species. The only specimen of *maculatus* known from our area is that from New Guinea described by Lesson as *B. azureus.* It is a large specimen and, as far as I know, other Indo-Pacific specimens, recorded as *maculatus,* too are large, whereas all known specimens of *rotundatus* are small. Hence it is supposed by several authors that *rotundatus* is the young of *maculatus*. However, there are objections to this supposition, as pointed out by Bleeker (1865). Provisionally I unite *maculatus* Bleeker and *rotundatus,* but I repeat Schultz's saying (1943): "The relationship of *C. maculatus* and *C. rotundatus* is not understood by me".

4. Family MONACANTHIDAE

Compressed. Body covered with small or minute rough scales which generally do not form regular series and rarely are in contact. Teeth not coalesced, the outer series in both jaws consisting of 6 teeth, the upper jaw with an inner series of 4 teeth. Two dorsals, the first of II spines, the second spine very small and sometimes absent, the first spine rigid or flexible, in one genus more or less hidden below the skin. Soft dorsal and anal long, all rays simple. All pectoral rays simple. Ventrals fused into a single spine which may be movable or not, rudimentary or absent.

Distribution: Marine fishes of tropical and subtropical seas.

Key to the Indo-Australian genera of Monacanthidae

I. No fleshy barbel on lower jaw.
  A. First dorsal spine fully erectile, locked by a second rudimentary spine when raised.
    a. Pelvic shield present. Ventral flap more or less developed. Anal with less than 40 rays.
      a^1. Mouth terminal, snout not produced 1. *Monacanthus* p. 313.
      b^1. Mouth dorsal. Snout produced . 2. *Oxymonacanthus* p. 335.
    b. Pelvic shield absent or nearly so. Ventral flap not developed. Anal with more than 40 rays.
      a^1. Dorsal spine originating over middle of eye . . . . 3. *Alutera* p. 337.
      b^1. Dorsal spine on snout, in advance of eye . . . . 4. *Pseudaluteres* p. 340.
  B. First dorsal spine not fully erectile, enveloped in skin which binds it to the back. No pelvic shield, no ventral flap. Strong curved spines on caudal peduncle . . . 5. *Paraluteres* p. 342.
II. A fleshy barbel on lower jaw. Very elongate. Dorsal spine feeble, setiform, 48-50 soft dorsal rays, 58-62 anal rays. . . . . . . 6. *Psilocephalus* p. 344.

1. **Monacanthus** Cuvier, Oken

(Cuvier, Oken, Isis, 1817, p. 152)

Oblong, compressed. Mouth terminal, snout not produced. Two dorsal spines, the first rigid, fully erectile, locked by the second rudimentary spine when raised. Second dorsal with 25-39 rays, anal with 22-36 rays. Pelvic shield present, ventral flap more or less developed. Ventral spine present, movable or not. Caudal rounded or slightly pointed.

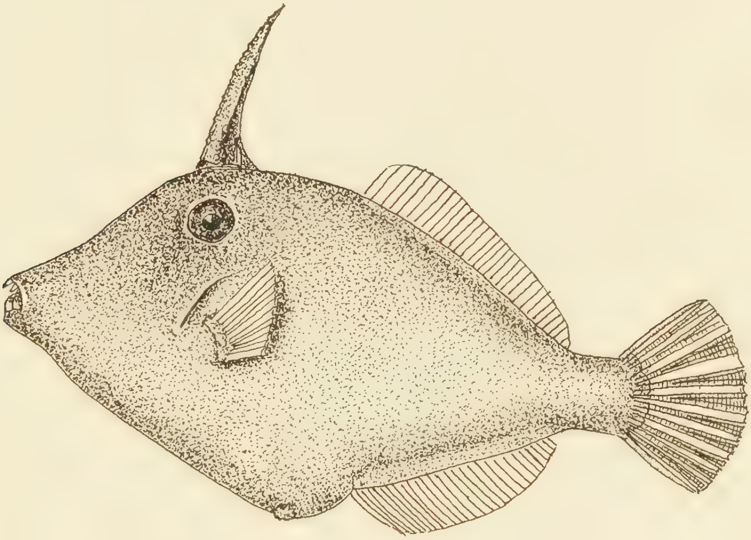

Fig. 75. *Monacanthus sandwichiensis* (Q. G.) × 5/7.

Distribution: Tropical and subtropical parts of Atlantic, Indic, and Pacific.

Note. Most authors split this large genus into a number of genera. In the following key which is based on that given by Fraser-Brunner (Ann. Mag. Nat. Hist. (11) VIII, 1941, p. 177), these genera are mentioned, so far as occurring in the Indo-Australian Archipelago.

Key to the Indo-Australian species of Monacanthus

A. Movable pelvic spine present.
  1. First dorsal spine originating over middle of eye, bearing a row of small upwardly directed barbs on its anterior

face, and a row of stronger downwardly directed ones on each posterior edge. Scales small, each with a row of backwardly directed spinules on hind edge, those on sides of tail bearing bristles. Pelvic shield and spine relatively large, with strong barbs. Ventral flap small (*Pervagor*).

a. No longitudinal black lines on sides.

a^1. Caudal peduncle deep, its length 2.3-2.5 in its depth. Barbs on dorsal spine crowded. Dorsal groove present. A black blotch on gill opening . . . . 1. *M. melanocephalus* p. 316.

b^1. Caudal peduncle deep, its length 2 in its depth. Dorsal groove present . . . . 2. *M. septemclassiensis* p. 317

c^1. Caudal peduncle less deep, 1.3-1.75 in its depth. Barbs on dorsal spine not crowded. No dorsal groove. Rather dark with a lighter band from gill opening to below origin of second dorsal, bordered by cloudy, dark, irregular bands. Similar dark patches on head, body, and tail. Caudal with two dark transverse bands.

a^2. Height in males 2-2.17, in females 1.84-2.1 . . . . 3. *M. tomentosus* p. 318.

b^2. Height in males less than 2, in females 1.7 . . . . . . 4. *M. hajam* p. 319.

d^1. Caudal peduncle 1.6 in its depth. Barbs of dorsal spine distant, few in number, alternating, and directed outwards and downwards. Sides of head and body silvery . . . . 5. *M. nitens* p. 320.

b. Nine black longitudinal lines on sides, extending from eye and breast toward caudal peduncle . . 6. *M. nigrolineatus* p. 321.

2. First dorsal originating behind middle of eye.

a. Scales very small. Each scale on side with a basal plate, bearing many spinules on top. No retrorse spines and no bristles on caudal peduncle. Ventral flap small. Pelvic spine slender, tapering (*Paramonacanthus*).

a^1. Elongate, height 3. Dorsal and anal concave . . . . 7. *M. curtorhynchus* p. 322.

b^1. Height 2-2.5. Dorsal and anal slightly convex. A dark blotch on sides below second dorsal.

a^2. Profile of snout slightly convex. A. 26. Caudal with 3 dark cross bands, body with numerous small spots . 8. *M. cryptodon* p. 323.

b^2. Profile of snout slightly convex. A. 28-29. Caudal with 3 dark cross bands . 9. *M. nemurus* p. 324.

c^2. Profile of snout slightly concave. A. 30. Two dark cross bands on caudal . . . 10. *M. choirocephalus* p. 325.

c^1. Skin with scattered, long, fringed filaments. Height 2.04-2.13. A. 26-27. Uniform brown . . . . 11. *M. nematophorus* p. 326.

b. Each scale on side with one strong central spinule, sometimes with smaller ones at base.

a^1. Caudal peduncle without retrorse spines. Ventral flap small or moderate. Dorsal spine usually with barbs on anterior face as well as on posterior edges.

a^2. Pelvic shield and spine small, tapering, moderately spinate on the edges. Soft dorsal and anal somewhat elevated anteriorly. Dermal filaments scarcely developed or absent. All scales, except on head, arranged in distinct longitudinal tracts (*Arotrolepis*) . . . . . 12. *M. sulcatus* p. 327.

b^2. Pelvic shield relatively large, quadrate, strongly spinate. Soft dorsal and anal not elevated anteriorly. Body deep, height 1.4. Caudal peduncle constricted at its base. Scales coarse. Dermal filaments greatly developed (*Chactoderma*) . . . . . 13. *M. spinosissimus* p. 328.

b^1. Caudal peduncle with 4-6 retrorse spines. Ventral flap greatly developed. Dorsal spine with barbs only on posterior edge (*Monacanthus* s. str.) . . . . 14. *M. chinensis* p. 329.

B. No movable pelvic spine.

1. Gill opening mostly before middle of eye. Dorsal spine over middle of

eye, not contained in a groove when depressed. Three small spines on lower half of tail in females (*Pseudomonacanthus*) . . . . 15. *M. macrurus* p. 331.

2. Gill opening mostly behind middle of eye. Dorsal spine contained in a groove when depressed. (*Amanses*).
   a. No patch of long spines on side between soft dorsal and anal. Caudal peduncle with bristles or small antrorse spines in males. . . . . 16. *M. sandwichensis* p. 332.
   b. A patch of long spines on sides between soft dorsal and anal, at least in males . . . . 17. *M. scopas* p. 334.

1. **Monacanthus melanocephalus** Blkr

Monacanthus melanocephalus Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 95.
Monacanthus janthinosoma Bleeker, ibid. VI, 1854, p. 504.
Monacanthus aspricaudus Hollard, Ann. Sci. Nat. II, 1854, p. 330.
Monacanthus melanocephalus Bleeker, Atlas Ichth. V, 1865, p. 127.
Monacanthus melanocephalus Günther, Cat. Brit. Mus. VIII, 1870, p. 242.
Monacanthus melanocephalus Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 365.
Monacanthus melanocephalus Günther, Fische der Südsee III, 1910, p. 450.
Monacanthus melanocephalus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 456.
Monacanthus melanocephalus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 956.
Monacanthus melanocephalus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 456.
Stephanolepis melanocephalus McCulloch, Mem. Austr. Mus. V, 1929, p. 415.
Monacanthus melanocephalus Tortonese, Boll. Mus. Zool. Anat. Comp. R. Univ. Torino XLV, ser. III, N. 63, 1935-1936, p. 59.
Stephanolepis melanocephalus Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 424.
Pervagor melanocephalus Whitley, Austr. Zoologist XI, Part 1, 1945, p. 38.
Pervagor melanocephalus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 401.
Pervagor melanocephalus Randall, Atoll Res. Bull. 47, 1955, p. 228, p. 229.

D^1. II. D^2. 29-31. A. 27-29. P. 12-13.

Profile of snout concave. Profile of head between first and second dorsal horizontal, not elevated at origin of second dorsal. Height measured between origin of second dorsal and anal (which is behind that of second dorsal) 2.26-2.38, 2.6-2.7 in length with caudal. Gill opening slightly oblique, almost vertical, somewhat less than eye, situated below hindborder of eye, its distance from snout 3-3.7, 3.6-4.1 in length with caudal. Eye 2.5-3.1 in snout. Teeth rather blunt, the anterior ones in the lower jaw emarginate; tips of all teeth orange. Origin of first dorsal above middle of eye, nearer tip of snout than origin of second dorsal. First dorsal spine almost as long as snout and eye, anteriorly with crowded pointed tubercles, the points directed upwards; on both sides a row of about 14 strong antrorse spines, those of both sides opposite to each other, and not alternating. Second dorsal spine minute. Dorsal groove short. Second dorsal and anal similar, but anal base shorter; all rays simple, the posterior ones longest, less than or equal to half length of snout. Upper pectoral rays longest, longer than longest dorsal rays. Pelvic spine with strong spines laterally and terminally, smaller spines inferiorly, articulating with end of pelvis (pelvis shield) which has four strong spines anteriorly, directed towards the head, one or two strong spines at the sides anteriorly and inferiorly covered by small spinules or pointed tubercles. Ventral flap small. Caudal short, rounded. Scales small, with a number of spinules posteriorly which grow longer and hairy on the tail and specially on the very short caudal peduncle, the length of which goes 2.3-2.5 in its depth. Colour of preserved specimens lighter or darker brown. A dark brown patch over gill opening. Second dorsal and anal with numerous narrow, brown, longitudinal bands. Caudal light yellowish, with a few zic-zac, parallel, transverse, subterminal bands, consisting of rows of spots. Length 98 mm. (Specimens of Bleeker's collection in Amsterdam Museum examined).

Habitat: Pulu Weh!; Batu Islands; Singapore; Solor; Batjan; Ternate; Ambon; Goram; Timor; New Guinea. — Coast of Natal, Mauritius, Red Sea, Japan, Philippines, Queensland, West Australia, New Hebrides, Gilbert Islands, Fiji, Rotuma, Samoa.

2. **Monacanthus septemclassiensis** (Barton)

Stephanolepis (*Pervagor*) septemclassiensies Barton, Am. Mus. Novit. 1303, 1945.

D^1. II. D^2. 29. A. 27. P. 11.

Profile of snout concave. Profile between the two dorsals straight, slightly ascending to second dorsal. Height 2.2-2.3. Head 2.9-3. Eye 3. Snout 1.4 in head. Gill opening somewhat oblique, situated almost entirely below posterior half of eye. The grand dorsal spine above middle of eye, more or less curved, rough on its anterior surface and carrying 12 downwardly directed spines at each posterior edge. A groove in middle of back behind the spine. Ventral spine ends in a six-pointed star and carries a few points above the star. Ventral flap triangular, not large. The second and third rays of the soft dorsal are prolonged in filaments reaching to or beyond end of fin posteriorly. Scales very small and carrying fine ciliate spines which are larger and recurved posteriorly. Length of caudal peduncle twice in its depth. Colour in alcohol dark yellowish gray, uniform gray on fins and snout. Indistinct dark dots on sides. Ventral flap dark. Two indistinct, dark, subterminal lines across caudal. Length 44 mm. (Compiled, not seen by me).

Habitat: New Guinea (Tanamerah Bay).

3. **Monacanthus tomentosus** (L.)

Balistes tomentosus Linné, Syst. Nat. ed. 10. 1758, p. 328.
Monacanthus tomentosus Cuvier, Règne Animal 11, 1817, p. 152.
Monacanthus trichiurus Bleeker, Nat. Tijdschr. Ned. Indië IV, 1853, p. 125.
Monacanthus tomentosus Bleeker, Atlas Ichth. V, 1865, p. 127.
Monacanthus tomentosus Günther, Cat. Brit. Mus. VIII, 1870, p. 238 (sine synon.).
Monacanthus tomentosus Macleay, Descr. Cat. Austral. Fish. II, 1881, p. 259.
Monacanthus tomentosus Day, Fishes of India, Suppl. 1888, p. 808 (sine synon.).
Monacanthus tomentosus Steindachner, Abh. Senckenb. naturf. Ges. XXV, 1901, p. 462.
Monacanthus tomentosus Johnstone, Pearl Oyster Rep. II, Fishes, 1904, p. 203.
Monacanthus nemurus Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 36 (nec Blkr.).
Monacanthus tomentosus Jordan & Richardson, ibid. XXVII (1907) 1908, p. 272.
Stephanolepis tomentosus Herre, Philipp. Journ. Sci. 25, No. 4, 1925, p. 453 (partim).
Monacanthus tomentosus Giltay, Bull. Mus. Hist. Nat. Belg. IX, No. 14, 1933, p. 13.
Stephanolepis tomentosus Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 425.
Pervagor tomentosus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 274.
Monacanthus tomentosus Inger, Fieldiana 36, No. 3, 1957, p. 402.

D^1. II. D^2. 27-30. A. 25-28. P. 10-12.

Profile of snout more or less concave. Profile between the two dorsals straight, slightly ascending to second dorsal, the base of which is somewhat elevated. Height (between origin of second dorsal and anal) in males 2-2.17, 2.5-2.67 in length with caudal, in females 1.84-2.1, 2.28-2.59 in length with caudal. Eye 2.4-2.6 in snout. Gill opening slightly oblique, almost vertical, its superior end below or slightly behind hindborder of eye, its inferior end slightly before superior end of base of pectoral and its distance from tip of snout 3.27-3.6, 4-4.44 in length with caudal. First dorsal spine above middle of eye, more or less curved, its anterior side covered with bony tubercles which grow into small, upwards directed spines near the tip of the spine. Sides of spine each with a row of distant, strong, antrorse spines, 7-12 in number. Second spine minute. No dorsal groove. Distance between origin of first dorsal and origin of second dorsal equal to or somewhat more than snout. Rays of second dorsal subequal, somewhat more than eye. Origin of anal below that of second dorsal; anal rays subequal and about as long as those of second dorsal. Pectorals somewhat longer than eye. Pelvic shield and pelvic spine with tubercles and some rather strong spines. Ventral flap moderate, covered by rows of abnormal, elongate scales. Scales of head and body rounded, with a row of small spinules posteriorly, which are longer towards the caudal peduncle; in males they are much elongate and form a hairy patch. Length of caudal peduncle 1.3-1.75 in its depth. Small tentacles on body and tail sometimes present. Colour of preserved specimens reddish brown, a lighter curved band from behind gill opening to vertical between origin of second dorsal and anal, often present. This band bordered at the sides and behind by irregular, cloudy, dark bands. Similar cloudly dark patches scattered on head, body, and tail, oten forming about 4 transverse bands on underside between snout and end of pelvic. First dorsal spine more or less banded with dark. Second dorsal, anal, and pectorals hyaline. Caudal light yellowish with a median and a terminal broad brown band, sometimes with very narrow transverse white lines on the terminal band. Length 115 mm. (A specimen of Bleeker's collection in the Amsterdam Museum examined).

Habitat: Singapore; Java!; Borneo (Sandakan, Balikpapan!); Celebes (Makassar!, Tello!, Menado); Postillion Islands; Biaru!; Sumbawa!; Ternate; Batjan; Buru; Ceram; Ambon!; Goram; Timor; Kei Islands! Aru Islands; Waigeu!; New Guinea (Sorong!, Madang). — Zanzibar, Persian Gulf, Ceylon, China, Japan, Philippines, Pelew Islands, New Britain, Solomon Islands, Queensland, New South Wales?, Fiji.

4. **Monacanthus hajam** Blkr.

Monacanthus hajam Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 18.
Monacanthus tomentosus Bleeker, ibid. p. 19 (nec L.).
Monacanthus hajam Bleeker, Atlas Ichth. V, 1865, p. 126.
Monacanthus hajam Peters, Monatsber. Akad. Wiss. Berlin (1868) 1869, p. 275.
Monacanthus surothura Jordan & Seale, Proc. U. S. Nat. Mus. XXVIII, 1905, p. 790.
Monacanthus (*Sarothrura*) *hajam* Whitley, Austr. Zool. 11, Part. 2, 1947, p. 149.

Monacanthus (Sarothoura) hajam Whitley, W. Austr. Fisheries Bull. No. 2, 1948, p. 31.

D¹. II. D². 27-29. A. 25-28. P. 11.

This species does not differ from *M. tomentosus* otherwise than in having a deeper body. Most authors consider it a synonym of *tomentosus*. Above I have cited all authors who accept it as a species of its own. It is certainly not a geographical subspecies, but it may be an ecological one.

Habitat: Singapore; Biliton; Java (Jakarta); Duizend Islands; Bawean; Celebes (Makassar); Flores; Halmahera; Ternate; Buru; Ambon; Goram; Aru Islands; Waigeu; New Guinea. — Pinang, Philippines, east Australia.

Note. Jordan & Seale (l.c.) say: "The manuscript name of van Hasselt, *surothura,* published by Bleeker in an earlier paper, seems to claim priority over his own name *hajam*". This is not so, for Bleeker made a mistake when citing in the Atlas (l.c.) and in Ned Tijdschr. Dierk. III, 1866, p. 26, as a synonym of hajam: "*Monacanthus surothura*" Hass. ic. ined. Blkr, Verh. Bat. Gen. XXIV Balist, p. 18". In last named paper of 1852 no mention is made of van Hasselt's name given to this species.

5. **Monacanthus nitens** Hollard

Monacanthus nitens Hollard, Ann. Sci. Nat. (4) II, 1854, p. 364.
Monacanthus nitens Waite, Proc. Linn. Soc. New S. Wales (2) IX, part 2, 1894, p. 224.
Monacanthus nitens? Ogilby, ibid. XXIII, part 4 (1898) 1899, p. 740.
Monacanthus alternans Ogilby, ibid. p. 741.
Monacanthus melanocephalus M. Weber, Siboga Exp. Fische, 1913, p. 578 (partim, nec Blkr.).
Stephanolepis nitens McCulloch, Mem. Austr. Mus. V, Part III, 1929, p. 415.
Stephanolepis (Pervagor) nitens Whitley, Austr. Zool. 6, No. 3, 1930, p. 121.

D¹. II. D². 31. A. 28. P. 11-12.

Profile of snout concave, profile of back between the two dorsals horizontal. Height, measured between origin of second dorsal and origin of anal 2.6-2.7, 3.1 in length with caudal. Head, measured from lower end of gill opening 2.8-3, 3.3-3.6 in length with caudal. Gill opening slightly oblique, almost vertical, below posterior part of eye in a specimen of 41 mm, totally behind vertical through hindborder of eye in a specimen of 47 mm. Eye 2.6-2.8 in snout. First dorsal spine above middle of eye, its anterior border with two rows of small tubercle-like spines, larger and alternating near the tip where some of the spines are sometimes bifid. Sides of spine each with a row of barbs, pointing outwards and downwards, small and opposite to each other at the base, long and alternating along the rest of the spine; the long barbs about 6-7 in number on each side. Second dorsal spine minute. Dorsal groove well developed. Distance between origin of first dorsal and origin of second dorsal equal to or slightly longer than snout. Second dorsal and anal convex, the median rays longer than the others. Origin of anal slightly behind that of second dorsal. Pectorals fan-shaped, their length 1.6 in snout. End of pelvic and movable pelvic spine with strong spinules. Ventral flap not strongly developed. Caudal rounded. Length of caudal peduncle 1.6 in its depth. Scales small, those of sides elongate in dorso-ventral direction; each scale with a spine, these spines much longer on scales along dorsal groove and base of second dorsal, and on ventral flap. Colour of preserved specimens light brown with a silvery hue, most conspicuous on sides of head, ventral flap, and sides of body. Fins hyaline, caudal with three transverse brown bands. Length 50 mm.

Habitat: Fau!; Banda! — New South Wales, Lord Howe Island, Tongatabu.

Note. The description given above is made after two specimens, 41 and 47 mm long, recorded by M. Weber, l.c., as *M. melanocephalus,* probably as Günther (Fische der Südsee III, 1910, p. 450) considered *nitens* to be a young stage of *melanocephalus.*

M. nitens differs from *melanocephalus,* besides in the very different colouring, in the structure of the first dorsal spine, the barbs of which are distant and alternating, whereas they are rather crowded and opposite to each other in *melanocephalus.*

6. **Monacanthus nigrolineatus** (Herre)

Stephanolepis nigrolineatus Herre, Philipp. Journ. Sci. 32, No. 3, 1927, p. 415.
Pervagor nigrolineatus Fraser-Brunner, Ann. Mag. Nat. Hist. (11) VIII, 1941, p. 183.

D^1. II. D^2. 29. A. 25.

Height 2-2.18. Head 3.2-3.27. Snout elongate with very convex dorsal profile, 1.5 in head. Eye 3, 2 in snout. Interorbital space convex. Lower extremity of diagonal gill opening just in front of the upper part of pectoral base, its upper extremity beneath posterior margin of eye. First dorsal stout, backward-curved spine over middle of eye, its length equal to snout. Anterior surface of spine very rough with many small, upward-directed, pointed spinelets; on each corner of the posterior surface is a row of seven to nine stout barbs pointing downward and outward. The short, freely movable ventral spine has a terminal spine and two lateral spines on each side. First ray of second dorsal low, the next three elongated or very elongate and filiform, in one specimen about as long as head, the other rays uniform, low, equal to anal rays in height, less than an eye diameter in height. The anal rays all about the same length. Length of subtruncate caudal equals snout, one half times in head, twice in eye. Body covered with very small scales, each bearing on its posterior margin a slender spinelet or prickle; anteriorly these are very short and fine, but on the posterior half of body they become elongate and on the caudal peduncle are shorter, recurved, forming a mat of conspicuous bristles. Colour in alcohol blackish grey, a little paler on throat, with nine black longitudinal lines on sides, extending from eye and breast back toward caudal peduncle. Fins uniform. Length 59 mm. (After Herre, not seen by me).

Habitat: Bungau, Sulu Province.

7. **Monacanthus curtorhynchus** Blkr

?*Monacanthus oblongus* Schlegel, Fauna Japonica, Pisces 6, 1950, p. 291.
Monacanthus curtorhynchus Bleeker, Nat. Tijdschr. Ned Indië VIII, 1855, p. 430.
Monacanthus kurtorhynchus Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 272.
Paramonacanthus curtorhynchus Bleeker, Atlas Ichth. V, 1865, p. 130.
Monacanthus curtorhynchus Günther, Cat. Brit. Mus. VIII, 1870, p. 324.

D^1 II. D^2. 27. A. 26. P. II.

Profile of head arched. Height, measured between origin of second dorsal and anal, 3, 3.64 in length with caudal. Head 3.3,4 in length with caudal. Eye 3.2, 2.57 in snout and slightly more than convex interorbital space. Gill opening below hindborder of eye. First dorsal spine above posterior half of eye, its length 1.5 in head; slender, the anterior surface with short tubercles or granulations, the sides posteriorly with about 5 short retrorse barbs. Second spine minute. Second dorsal and anal concave, somewhat falcate, the longest rays in the anterior part of the fin, those of the dorsal 1.73, those of the anal 1.8 in head. The posterior dorsal rays about one fifth of the longest rays. Pectorals slightly rounded, the longest rays 2.5 in head. Pelvic shield with 3 small spinules at its proximal end. Pelvic spine movable, tapering, granulated, with small spinules at its side and at its end. Caulal rounded, the upper ray produced into a bifid filament. Least depth of caudal peduncle 1.04 in its length. Colour of preserved specimen brown with indications of a large, dark, oblong blotch below second dorsal and of a small dark saddle on caudal peduncle. Caudal with indications of two dark cross bands. Length of specimen described 92 mm.

Habitat: Ambon! In sea.

Note. Bleeker described this species after two specimens from Ambon, 92 and 103 mm long. It has, as far as I know, never been found again. The smaller of the two typical specimens in the Leiden Museum is described here, the larger one is in the British Museum.

Fraser-Brunner (Ann. Mag. Nat. Hist. (11) VIII, 1941, p. 183) united *curtorhynchus* with *M. oblongus* Schl. Bleeker already hesitated to separate *curtorhynchus* from his *Monacanthus broekii* which is now considered a synonym of *oblongus*. The habitat of *M. oblongus* ranges from Japan and Queensland to the Persian Gulf, the Seychelles and Cargados Carajos.

8. **Monacanthus cryptodon** Blkr

Monacanthus cryptodon Bleeker, Nat. Tijdschr. Ned. Indië VIII, 1855, p. 431.
Monacanthus kryptodon Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 272.
Paramonacanthus cryptodon Bleeker, Atlas Ichth. V, 1865, p. 131.
Monacanthus cryptodon Günther, Cat. Brit. Mus. VIII, 1870, p. 233.
Stephanolepis cryptodon Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 455.

D^1. II. D^2. 27. A. 26. P. 10.

Profile of snout very slightly convex, that of back between the dorsals horizontal. Gill opening oblique, below posterior half of eye, its distance from tip of snout 3.3, 4.1 in length with caudal. Eye 3, 2.4 in snout. Height 2.2, 2.75 in length with caudal. Origin of first dorsal behind middle of eye. First dorsal spine slender, its anterior face with crowded tubercles, its sides each with a row of not very strong antrorse barbs, some of them bifid, one point directed upwards and the other downwards, its length 1.35 in head. Second dorsal convex, the longest rays thrice in head. Origin of anal slightly behind that of second dorsal, its longest rays 3.2 in head. Longest pectoral rays 2.7 in head. Pelvic shield with 3 spines at its proximal end. Pelvic spine movable, tapering, with small barbs at its sides. Caudal rounded. Length of caudal peduncle 1.4 in its depth. Scales small, with many spinelets. No caudal bristles. Colour of preserved specimen light brown. Head, body and tail mottled with darker. A large dark oval blotch on upper part of sides, half before and half behind origin of dorsal. A second blotch below and somewhat behind the first one, followed by some small rounded blotches. Caudal with broad dark cross bars, other fins uniform. Length 88 mm. (Type of the species in the British Museum examined).

Habitat: Singapore; Celebes (Makassar!); Ambon. — Siam, Philippines.

Note. The description is made after the type. I also examined specimens, 57-60 mm, from Makassar and preserved in the Amsterdam Museum. They differ from the type in having 28-30 rays in the second dorsal, 28-31 rays in the anal, and 12 pectoral rays. In this respect they are more like *choirocephalus* but otherwise they agree with the type, also in coloration.

9. **Monacanthus nemurus** Blkr

Monacanthus nemurus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 20.
Paramonacanthus nemurus Bleeker, Atlas Ichth. V, 1865, p. 132.
Monacanthus nemurus Günther, Cat. Brit. Mus. VIII, 1870, p. 242.

D^1. II. D^2. 28. A. 28-29. P. 11.

Profile of snout slightly convex. Height, measured between origin of second dorsal and anal 2.17-2.5, 2.64-3 in length with caudal. Head 3.2-3.36, 3.88-4 in length with caudal. Eye 3.28-4, 2.64-3.5 in snout and about equal to convex interorbital space. Gill opening below posterior half of eye. First dorsal spine below posterior half of eye, granulated on its anterior face and with 9 rather strong barbs on sides. Second dorsal spine minute. Dorsal and anal somewhat rounded, the longest rays in the anterior part of the fin, those of dorsal 2.2-2.3, those of anal 2.4 in head. Pectorals slightly rounded, the longest rays 2.2-2.5 in head. Pelvic shield with rather strong spinules at its proximal end. Pelvic spine movable, tapering, granulated, with spinules on sides and on top. Caudal rounded. Length of caudal peduncle 1.6 in its least depth. Colour of preserved specimens brownish, a faint darker blotch below middle of second dorsal and another as a saddle on caudal peduncle. Caudal with 3 faint dark cross bands. Length of specimens examined 90 and 103 mm.

Habitat: Java (Jakarta); Singapore.

Note. The description is made after two typical specimens of Bleeker's collection in the Leiden Museum. They are, as far as I can see, the only specimens known. In the Atlas (l.c.) Bleeker records 4 specimens, 76-100 mm long, but in the catalogue of the sale of his collection only 2 specimens are mentioned, which are now in the Leiden Museum. It is not known where the other two specimens have gone to; they are not in the British Museum. Günther (l.c.) says about *nemurus* that it "is closely allied to *M. choirocephalus*, but has the body somewhat less elevated, and the upper profile of the snout a little convex (the upper caudal ray is produced into a short filament).", apparently without having seen specimens and quoting what Bleeker says about this species. I cannot find the produced ray of the caudal, but possibly it is broken in the specimens which are a hundred years old. The two specimens are rather different, the smaller one (probably a female) being less elongate than the other (probably a male) and having a shorter snout and hence a shorter head, whereas the profile of the snout is less arched. There are no traces of the longitudinal orange brown bands on body and tail which Bleeker describes and figures in the Atlas, but which he does not mention in the original description of the species.

10 **Monacanthus choirocephalus** Blkr

Monacanthus choirocephalus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 11, p. 19.
Paramonacanthus choirocephalus Bleeker, Atlas Ichth. V, 1865, p. 131.
Monacanthus choirocephalus Günther, Cat. Brit. Mus. VIII, 1870, p. 242.
Monacanthus choirocephalus Day, Fishes of India, Part IV, 1878, p. 693.
Stephanolepis choirocephalus Fowler, Proc. Acad. Nat. Sci. Philadelphia 89, 1937, p. 262.
?*Paramonacanthus horae* Fraser-Brunner, Ann. Mag. Nat. Hist. (11) VIII, 1941, p. 196.
Paramonacanthus choirocephalus Blegvad, Danish Sci. Inv. Iran, Part III, 1944, p. 213.
Paramonacanthus choirocephalus Munro, The marine and fresh water fishes of Ceylon. 1955, p. 274.

D^1. II. D^2. 28-30. A. 30. P. 12.

Dorsal profile of snout slightly concave, that of back between the dorsals horizontal, base of second dorsal at origin slightly elevated. Height, measured between origin of second dorsal and anal 2-2.1, 2.5-2.55 in length with caudal. Eye 2.66-3.3, 2-2.5 in snout. Gill opening somewhat oblique, the upper end below hindborder of eye, the lower end below hindborder of pupil. Distance of lower end of gill opening to tip of snout 3-3.2, 3.7-4 in length with caudal. First dorsal spine above hindborder of eye or nearly so, its frontborder with rows of tubercles or small blunt spinules, those near tip sometimes bifid, its posterior part with two rows of distant, rather strong retrorse spines. Second dorsal spine minute. Soft dorsal rays slightly increasing in length to about the 7th, which is half length of snout. Origin of anal below that of second dorsal, the longest rays shorter than those of second dorsal. Pectorals below first dorsal spine, about equal to distance between the lower end of its base and eye. Pelvic shield anteriorly with some strong spines directed forwards. Pelvic spine movable, with some spinules at its end. Caudal rounded.

Length of caudal peduncle 1.25-1.6 in its depth. Scales small with two or more slender spinules directed tailwards. Colour of preserved specimens brownish with indications of a dark blotch below anterior part of second dorsal and two transverse bands on caudal. Length 92 mm. (Type of the species in the British Museum and specimens of Bleeker's collection in the Amsterdam Museum examined.)

Habitat: Singapore; West Sumatra; Nias; Banka; Java (Jakarta); Celebes (Makassar, Badjoa); Flores: — Ceylon, eastern coast of India, Siam, Cochinchina.

Note. Karoli (Termeszetrajzi Füzetek V, 1882, p. 41) records this species from Japan, but this is probably a mistake, as the species has never been found there again and as the localities mentioned by Karoli often are erroneous.

I am not sure that *Paramonacanthus horae* Fraser-Brunner differs from *choirocephalus*. Fraser-Brunner says that the type of *choirocephalus* has 14 pectoral rays, whereas *horae* has 12, but the type of *choirocephalus* as well as the other specimens of Bleeker's collection I have seen have only 12 rays in the pectoral.

11. **Monacanthus nemathophorus** Gthr

Monacanthus nematophorus Günther, Cat. Brit. Mus. VIII, 1870, p. 241.
Paramonacanthus nematophorus Bleeker, Ned. Tijdschr. Dierk. IV (1871) 1872, p. 122.
Monacanthus nematophorus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 456.

D^1. II. D^2. 25-26. A. 26-27. P. 11.

Profile of snout slightly concave. Profile of back horizontal, slightly elevated before second dorsal. Height 2.04-2.13, 2.61-2.66 in length with caudal. Head 3-3.1, 3.8-3.9 in length with caudal. Eye 3-3.6, 2.4-2.9 in snout. Origin of first dorsal above hindmargin of eye, the first spine as long as or slightly longer than snout, its anterior face with crowded tubercles, sides with a row of rather strong antrorse barbs. Length of longest dorsal rays 2.1-2.7 in length of first dorsal spine. Origin of anal below that of second dorsal, its longest rays somewhat longer or shorter than longest dorsal rays. Pectorals rounded, the longest rays half length of snout. Pelvic spine with strong spinules, tapering towards its end. Caudal rounded. Length of caudal peduncle 1-1.1 in its least depth. Skin velvety with conspicuous long, fringed filaments, scattered over body and tail. No spines or bristles on caudal peduncle. Uniform brown, the filaments either dark or light. Caudal often with two or three transverse bands. Length 92 mm. (Type of the species in British Museum examined).

Habitat: Borneo?! — Cargadas Casajas!, Amintes!

Note. The specimens recorded by M. Weber (Siboga Exp. Fische, 1913, p. 578) as *nematophorus* do not belong to that species. One of them is *M. choirocephalus*, the others are too small to name them but apparently belong to different species.

Monacanthus sulcatus Hollard

Monacanthus sulcatus Hollard, Ann. Sci. Nat. (4) II, 1854, p. 363.
Monacanthus isogramma Bleeker, Nat. Tijdschr. Ned. Indië XIII, 1857, p. 367. — Atlas Ichth. V, 1865, p. 128.
Monacanthus sulcatus Günther, Cat. Brit. Mus. VIII, 1870, p. 239.
Monacanthus sulcatus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 260 (pro parte?).
Monacanthus sulcatus Rutter, Proc. Acad. Nat. Sci. Philadelphia 1897, p. 80.
Stephanolepis sulcatus Jordan & Evermann, Proc. U. S. Nat. Mus. XXV, 1902, p. 359.
Monacanthus sulcatus Lin, Lingnam Sci. Journ. 13, 1934, p. 690.
Astrolepis sulcatus Fraser-Brunner, Ann. Mag. Nat. Hist. (11) VIII, 1941, p. 184.

D^1. II, D^2. 31-35. A. 31-33. P. 13.

Profile from tip of snout to origin of dorsal ascending in an almost straight line. Height measured between origin of second dorsal and anal 2.4, 2.8 in length with caudal. Gill opening oblique, totally or almost totally behind eye, its distance from tip of snout 3, 3.4 in length with caudal. Eye 3.2, 2 in snout, and somewhat more than convex interorbital space. First dorsal spine (broken in type) originating above posterior border of eye, its length apparently shorter than snout, its sides with alternating, distant barbs. Second dorsal spine rudimentary. Profile between the two dorsals horizontal. Second dorsal rather elevated anteriorly, the 7th ray longest and about equal to snout. Origin of anal slightly behind that of second dorsal. Anal similar to second dorsal, 7th ray longest and equal to snout. Pectorals rounded, 2.1 in head. Pelvic spine movable, short, with four rather long spinules at its proximal and two smaller ones at the distal end. Length of caudal peduncle 1.3 in its depth. Caudal rounded, one of the upper rays may be filamentous. Scales with a long, pointed curved spine, those of body and tail arranged in longitudinal rows. Colour of preserved specimens brown. Length 95 mm. (Type of the species in the Paris Museum examined).

Habitat: Singapore; Banka; Java (Jakarta). — Zanzibar?, Malay Peninsula, China, Formosa, Australia?

Note. Gunther records *M. isogramma* from Zanzibar (Fishes of Zanzibar, 1866, p. 136)but in 1870 (l.c.) he does not mention

Zanzibar among the habitat of *M. sulcatus*. As Fraser-Brunner remarks (Ann. Mag. Nat. Hist. (11) VIII, 1941, p. 188), the Australian records of *sulcatus* possibly belong to *Monacanthus* (*Astrolepis*) *barbarae* or to *Monacanthus* (*Astrolepis*) *filicauda* Gthr, as suggested by Whitley (Austr. Zool. VI, Part IV, 1931, p. 331). Lastnamed species differs from *sulcatus* in having 36-37 rays in the anal and by a large eye. The type was collected south of New Guinea, other specimens are known from the coast of Queensland, whereas the subspecies *notonecrianus* Whitley occurs in New South Wales.

13. **Monacanthus spinosissimus** (Q. G.).

Balistes spinosissimus Quoy & Gaimard, Voyage Uranie & Physicienne, Zool. 1824, p. 211.
Monacanthus penicilligerus (Peron) Cuvier, Règne Animal 2. ed. II. 1839, p. 374.
Monacanthus penicilligerus Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850, p. 1333.
Monacanthus penicilligerus Hollard, Ann. Sci. Nat. (4) II, 1854, p. 350.
Monacanthus penicilligerus Bleeker, Nat. Tijdschr. Ned. Indië XVII, 1858-1859, p. 173.
Chaetodermis penicilligerus Bleeker, Atlas Ichth. V, 1865, p. 129.
Monacanthus penicilligerus Günther, Cat. Brit. Mus. VIII, 1870, p. 245.
Monacanthus penicilligerus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 263.
Chaetodermis spinosissimus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 457.

D^1. I. D^2. 25-26. A. 23-24. P. 12.

Profile from tip of snout to origin of first dorsal rather steeply ascending, slightly concave between mouth and eye. Height, measured between origin of second dorsal and origin of anal 1.4, 1.96 in length with caudal. Gill opening almost vertical, totally behind eye, its distance from tip of snout 2.7, 3.7 in length with caudal. Eye 3.4 in the long snout. First dorsal without visible second spine, the first spine behind eye, short, curved, covered with irregularly arranged blunt and pointed barbs and with more or less branched fleshy filaments. Profile between the two dorsals horizontal in its anterior part, rather abruptly elevated towards base of second dorsal, the longest rays of which are slightly shorter than dorsal spine. Origin of anal behind that of second dorsal, otherwise similar to second dorsal. Pectorals thrice in distance between tip of snout and first dorsal. Pelvic long, its shield and the short pelvic spine with moderate spinules and some branched filaments. Caudal slightly pointed, almost rounded. Caudal peduncle constricted at its base, its least depth 1.58 in its length. Scales coarse, those of head and anterior part of body smaller than those of posterior part of body and tail, which are arranged in longitudinal rows. All scales with a weaker or stronger spine, curved backwards, and with two or more smaller spines at their anterior side. Head, body, and tail with long, branched, fleshy distant filaments. Colour of preserved specimens light reddish brown; two dark blotches, about the size of the eye, in a horizontal line, the anterior one above pectorals. Dark cloudy patches below second dorsal and above anal. Length 180 mm.

Habitat: Singapore; Bali; Celebes (Makassar); Aru Islands!; New Guinea. — Siam, Pinang, Australia.

Note. Peters (Monatsber. Akad. Berlin 1876, p. 852) mentions *M. penicilligerus* from the Sargasso Sea in a list of fishes collected by the Gazelle-expedition. As the Gazelle made extensive collections in the Indo-Australian Archipelago and Australia, possibly a mistake was made in the labelling of the specimen.

14. **Monacanthus chinensis** (Bl)

Balistes chinensis Osbeck, Iter Chinensis, 1757, p. 147.
Balistes chinensis Bloch, Ausländ. Fische II, 1786, p. 29.
Monacanthus chinensis Cuvier, Règne Animal, 1. ed. 1817, p. 152.
Monacanthus geographicus Cuvier, ibid. 2. ed. 1829, p. 373.
Monacanthus geographicus Cantor, Journ. Asiat. Soc. Bengal XVIII, Part II (1849), 1850, p. 1330.
Monacanthus geographicus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 17.
Monacanthus Cantoris Bleeker, l.c. — Nat. Tijdschr. Ned. Indië III (1851) 1852, p. 80.
Balistes granulosus Gronovius, Syst. ed. Gray, 1854, p. 34.
Monacanthus chinensis Bleeker, Atlas Ichth. V, 1865, p. 125.
Monacanthus chinensis Kner, Novara Exp. Fische, 1865-1867, p. 395.
Monacanthus chinensis Günther, Cat. Brit. Mus. VIII, 1870, p. 236.
?*Monacanthus nebulosus* Agassiz, Pisces Celebes, London, 1874, Tab. 4.
Monacanthus chinensis Klunzinger, Sitzber. Akad. Wien LXXX (1879) 1880, p. 421.
Monacanthus Chinensis Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 258.
Monacanthus chinensis Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 262.
Monacanthus chinensis Jordan & Seale, ibid. XXIX, 1905, p. 524. — Bull. Bur. Fish. XXVI (1906) 1907, p. 36. — Proc. Dav. Acad. Sci. X (1905) 1907, p. 14.
?*Monacanthus megalurus* M. Weber, Siboga Exp. Fische, 1913, p. 579.
Monacanthus chinensis McCulloch, Austr. Zool. II, Part III, 1922, p. 124.
Monacanthus chinensis Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 451.
Monacanthus chinensis Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 456. — Hongkong Nat. 6. Suppl. 1938, p. 49. — Ichth. Notes, No. 2. Dept. Harbours and Marine, Queensland, 1953, p. 19.

D^1. II. D^2. 28-30. A. 27-30. P. 11-12.

Dorsal profile ascending from tip of snout to origin of second dorsal with two concavities, one between tip of snout and first dorsal and the other between first and second dorsal. Height, measured between origin of second dorsal and origin of anal, 1.7-2, 2.25-2.6 in length with caudal. Gill opening slightly oblique, almost vertical, below posterior part of eye, the distance between its anterior end and tip of snout 3.3-3.6, 4-4.6 in length with caudal. Eye 2-2.3 in snout. Mouth horizontal, small. Chin somewhat prominent, teeth slightly emarginate. Origin of first dorsal above middle of eye. First dorsal spine shorter or longer than snout, strong, with longitudinal rows of small tubercles and a row of large, distant, antrorse barbs along each side posteriorly. Second dorsal spine minute, scarcely visible at the base of the short dorsal membrane. Dorsal groove not developed. Base of second dorsal as long as that of anal and equal to or slightly less than distance between origin of first dorsal and second dorsal. Anal as deep as second dorsal, the anterior rays of both fins longest, about as long as half length of first dorsal spine. All dorsal and anal rays simple. Pectorals short, fan-like. Pelvic ending in an articulated movable spine, to which is attached the inferior and anterior end of a large ventral flap like a pendulous dewlap which extends below body contour proper much farther than the anal. Caudal rounded. Head, body, and tail covered with small scales, each of which with a compressed spine curved towards the tail, those of the lateral line with two or more spines. Adult males with two longitudinal rows, each of 3-4 curved spines on caudal peduncle. Colour of preserved specimens light brown or yellowish, body clouded with dark brown, irregular broad bands running from pectoral to anterior part of base of second dorsal and from the ventral flap obliquely backwards to middle of body, connected here by a horizontal band to base of caudal. Sides of body with small brown spots. First dorsal brown, second dorsal and anal hyaline, often with longitudinal narrow bands, sometimes forming longitudinal chains of small brown rings on the anal. Caudal yellowish with several transverse dark bands, some of these consisting of rows of small, dark spots. Length 288 mm.

Nomen indig.: Hajam.

Habitat: Singapore; Banka; Bintang; Java (Jakarta!); Borneo (Sandakan, Balikpapan!); Celebes (Makassar! Badjoa); Ternate; Ambon; Aru Islands; New Guinea (Sorong!, Port Moresby). — Japan, China, Riu Kiu Islands, Formosa, Tonkin, Siam, Malay Peninsula, Philippines, Thursday Island!, Australia, Samoa.

Note. *M. nebulosus* is only known as a drawing in an unfinished work which was found amongst the papers of L. Agassiz after his death. This work was published by Barnard Quaritch. It is not clear from the drawing if the pelvic spine is movable.

The specimen, 52 mm long, recorded by M. Weber (l.c.) from the Aru Islands as *M. megalurus* Richardson probably belongs to chinensis. It has D². 31, A. 31, P. 12. Height 1.8, 2.47 in length with caudal. Head 2.6, 3.58 in length with caudal. Eye twice in snout. Scales not different from those of *chinensis*. It differs from *chinensis* in having branched filaments on head, body, and tail and on the dorsal spine, but as all specimens of *chinensis* seen by me are of a larger size, it may be possible that the presence of filaments is a juvenile characteristic.

15. **Monacanthus macrurus** Blkr

Monacanthus macrurus Bleeker, Nat. Tijdschr. Ned. Indië XII, 1856, p. 226.
Pseudomonacanthus macrurus Bleeker, Atlas Ichth. V, 1865, p. 134.
Monacanthus macrurus Günther, Cat. Brit. Mus. VIII, 1870, p. 247.
Cantherines macrurus Jordan & Seale, Proc. U. S. Nat. Mus. XXVIII, 1905, p. 790.
Cantherines macrurus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 458.
Cantherines macrurus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 459.
Pseudomonacanthus macrurus Fraser-Brunner, Bull. Raffles Mus. No. 16, 1940, p. 65.
Pseudomonacanthus tweedici Fraser-Brunner, ibid. p. 66.
Pseudomonacanthus macrurus Fowler, Mem. B. P. Bishop Mus. XII, 1949, p. 155.

D¹. II. D². 29-30. A. 27-30. P. 11-12.

Profile of snout concave. Height between origin of second dorsal and origin of anal 2.5-2.8, 3-3.4 in length with caudal. Gill opening oblique, equal to or somewhat longer than eye, its posterior end below middle of eye, its anterior end below nostrils and its distance from tip of snout 4-4.6, 5-5.8 in length with caudal. Eye 3.1-3.2 in snout. Mouth more or less oblique. Teeth pointed, the anterior ones in the lower jaw emarginate; tips of all teeth orange. Origin of first dorsal above middle of eye or above posterior half of eye. First dorsal spine less than snout, with rows of antrorse barbs. Second dorsal spine slender, reaching end of dorsal membrane. Origin of second dorsal much nearer base of caudal than tip of snout, its base longer than that of anal and equal to or longer than snout and eye. Anal and dorsal rays subequal, equal to or longer than eye. Upper pectoral rays much longer than lower ones, longer than eye. Pelvic spine not movable, scarcely projecting beyond the rather large ventral flap. Caudal long, rounded. Caudal peduncle as deep as long or slightly deeper than long. Scales small, posteriorly with curved spinules, those on caudal peduncle sometimes elongate and erect. Simple or branched tentacles scattered on head, body, and tail. Females with two or three rather thick spines, directed tailwards but bent again headwards at their end, situated in a row on lower half of caudal peduncle. Colour of preserved specimens light reddish brown with darker clouds on body. Head, body and tail spotted all over with brown. Second dorsal, anal, and pectorals light yellow. Caudal light reddish brown with a broad vertical band in the middle and with a rather large deep brown blotch between the outer upper and lower rays, at a short distance from caudal base. Length 229 mm. (Specimens of Bleeker's collection in the Amsterdam Museum examined).

Habitat: Singapore; Nias; Celebes (Makassar); Saleyer!; Ambon; New Guinea (Sorong, Rubi). — South China Sea, Philippines, Australia.

Note. Picaglia (Atti Soc. di Modena (3) XIII, 1894, p. 36) records this species with a query from the Red Sea.

Fraser-Brunner, describing *Pseudomonacanthus tweediei* from Singapore, says: "It differs from *P. macrurus* in the smaller eye, wider interorbital space, shorter and more forwardly placed gill-opening, and more slender caudal peduncle". As I find such-like differences amongst specimens of *macrurus* of one and the same locality I don't think they are of specific value. It is not probable that it is a western subspecies of *macrurus*, as suggested by Fraser-Brunner, as the type of *macrurus* came from the island of Nias which is even more to the west than Singapore.

16. **Monacanthus sandwichiensis** (Q. & G.) (Fig. 75, p. 313)

Balistes sandwichiensis Quoy & Gaimard, Voyage Uranie, Zool. 1824, p. 214.
Monacanthus pardalis Rüppell, Neue Wirbelthiere, Fische des rothen Meeres, 1835, p. 57.
Monacanthus melanuropterus Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 781.
Monacanthus Houttuyni Bleeker, ibid. V, 1853, p. 533.
Monacanthus adspersus Hollard, Ann. Sci. Nat. (4) II, 1854, p. 362.
Liomonacanthus pardalis Bleeker, Atlas Ichth. V, 1865, p. 136.
Monacanthus pardalis Günther, Cat. Brit. Mus. VIII, 1870, p. 230.
Monacanthus pardalis Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 631.
Monacanthus fuliginosus Macleay, Proc. Linn. Soc. New S. Wales VII, 1882, p. 596.

Amanses sandwichensis Seale, Occas. Papers B. P. Bishop Mus. I, No. 3, 1901, p. 116.
Monacanthus pardalis Steindachner, Abh. Senckenb. naturf. Ges. XXV, 1901, p. 461.
Cantherines sandwichiensis Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 418.
Cantherines sandwichensis Jordan & Seale, ibid. XXV (1905) 1906, p. 364.
Monacanthus pardalis Günther, Fische der Südsee III, 1910, p. 448.
Cantherines pardalis Herre, Philipp. Journ. Sci. XXV, No. 4, 1924, p. 459.
Cantherines sandwichiensis Herre, ibid. p. 461.
Cantherines sandwichiensis E. K. Jordan, Proc. U. S. Nat. Mus. 66. Art. 33, 1925, p. 39.
Cantherines sandwichiensis Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 959.
Cantherines sandwichiensis Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 457.
Cantherines pardalis Fowler, ibid. p. 458.
Monacanthus pardalis P. Schmidt, Bull. Acad. Sci. U.R.S.S. 1930, p. 557.
Cantherines pardalis Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 423.
Cantherines sandwichiensis Fowler, Mon. Acad. Nat. Sci. Philadelphia 2, 1938, p. 245.
Amanses sandwichiensis J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 403.
Amanses pardalis Munro, The marine and fresh water fishes of Ceylon, 1955, p. 275.
Amanses sandwichiensis Randall, Atoll Res. Bull. 47, 1955, p. 288, p. 230.
Amanses sandwichiensis Whitley, The Austr. Zoologist XII, part 3, 1956, p. 293.
Cantherines pardalis Inger. Fieldiana 36, No. 3, 1957, p. 402.

D^1. II. D^2. 33-36. A. 29-34. P. 13-14.

Profile from snout to dorsal slightly concave. Height, measured between origin of second dorsal and anal 1.9-2.3, 2.3-2.8 in length with caudal. Gill opening slightly oblique, almost vertical, the distance of its anterior end to tip of snout 3.2-3.6, 3.9-4.3 in length with caudal. Eye 3-3.9 in snout, above gill opening. Teeth in jaws narrow, pointed, yellow tipped. Origin of first dorsal above anterior half of eye. First spine as long as distance between eye and corner of mouth, or somewhat shorter or longer. It has longitudinal rows of minute bony tubercles, those of a median anterior row and of a row on each side somewhat larger. Second dorsal spine minute, not reaching the upper end of the short membrane. The groove in which the first dorsal can be retracted, shallow posteriorly. Distance of origins of first and second dorsal less than base of second dorsal. Rays of second dorsal subequal, much shorter than first dorsal spine. Anal similar to second dorsal, but slightly shorter. Base of pectorals below posterior half of eye; length of longest pectoral rays 1.5 to about twice that of eye. Ventral spine short, provided with a few short spinules, immovably coalesced with pelvis. Length of caudal peduncle 1.4-2.2 in its depth. Skin covered with minute, rounded scales. Skin velvety when stroked toward tail, but rough when rubbed in the opposite direction. Colour very variable, even of the same individual during life (see Herre 1924). Colour of preserved specimen light brown or dark brown to blackish. Membranes of first dorsal and caudal of the same colour as that of the body. Second dorsal and anal light yellowish. Pectorals hyaline. Length 375 mm.

Habitat: Sumatra (Atcheen!, Priaman); Nias; Java (Patjitan); Bawean; Borneo (Pulo Bakkungaan Kechil); Celebes (Makassar!, Menado, Kema); Sulu Islands!; Karakelang!; Saleyer!; Flores; Rotti!; Sumba!; Samau!; Solor!; Ternate; Batjan; Buru; Ceram; Ambon; Nusa Laut!; coasts of northern and southern New Guinea. — Red Sea, Tropical Indic, Pacific, and Atlantic.

17. **Monacanthus scopas** (Cuvier)

Acanthurus scopas Cuvier, Règne Animal. Vol. 2. 1829, p. 224.
Monacanthus (Amanses) hystrix Gray, Illustr. Ind. Zool. II, 1883, p. 98.
Monacanthus (Amanses) hystrix Burton, Proc. Zool. Soc. London II, 1834, p. 121.
Monacanthus (Amanses) hystrix Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 351.
Amanses scopas Bleeker, Atlas Ichth. V, 1865, p. 133 [1]).
Monacanthus scopas Günther, Cat. Brit. Mus. VIII, 1870, p. 232.
Monacanthus nigricans Macleay, Proc. Linn. Soc. New S. Wales VII, 1882, p. 596.
Cantherines nigricans Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 364.
Amanses scopas Jordan & Seale, ibid. p. 365.
Monacanthus scopas Günther, Fische der Südsee III, 1910, p. 450.
Amanses scopas Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 459.
Amanses scopas Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 423.

D^1. II. D^2. 27-28. A. 24-25. P. 13.

Profile from snout to first dorsal slightly concave. Height, measured between origin of second dorsal and anal 1.81-2, 2.1-2.38 in length with caudal. Gill opening large, oblique, mostly behind middle of eye, the distance of its inferior end to tip of snout 3.8-4.09, 4.5-4.75 in length with caudal. Eye 3.3-3.84, 3.1-4.3 in snout, 1.16-1.5 in very convex interorbital space. First dorsal spine above eye, about as long as head, granulated or with small pointed tubercles on its anterior face and sides, posterior part of sides with some short distant barbs. Second dorsal spine minute. A deep groove on

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1) This page is misprinted: "135".

back in which the first dorsal can be retracted. Second dorsal and anal slightly rounded, longest dorsal rays 2.2-2.27, longest anal rays 2.12-2.35 in head. Origin of anal below 11th dorsal ray. Pectorals rounded, the upper rays longest and 1.82-1.94 in head. Pelvic spine not movable, short, with granulations, tubercles, and short spinules. Caudal rounded. Length of caudal peduncle twice in its depth. Scales small, those of caudal peduncle with short spines. In males on side of tail a patch of very long and slender spines, almost as long as first dorsal spine, 5 or more in number, each spine covered by skin, the points naked and directed towards the caudal fin. In females these spines are replaced by a patch of stiff britles, tooth brush-like. Colour of preserved specimens chocolate brown, including the skin on the spines on tail of the male; the bristles on that of the female light brown. Caudal peduncle and caudal fin very dark brown. Dorsal and anal light yellow. Length 200 mm.

Habitat: Celebes; Ambon!; Timor!; New Guinea. — Mauritius, Ponapé, New Britain, Solomon Islands, West Australia, Rotuma, Samoa, Society Islands, Taomotu Islands.

Doubtful species

Monacanthus setifer Bennett

Fraser-Brunner (Ann. Mag. Nat. Hist. (11) V, 1940, p. 518) has shown that *M. setifer* which has been referred to as an "East Indian" species by several authors, does not occur in the Indo-Australian Archipelago.

2. **Oxymonacanthus** Bleeker

(Bleeker, Atlas Ichth. V, 1865, p. 137)

Elongate, compressed. Snout long, pointed, the small dorsal mouth at its end. Gill opening small, behind eye. First dorsal with two spines, the first long and with barbs directed upwards at its anterior side, directed downwards on its posterior side. The spine contained in a dorsal groove when depressed. Second dorsal with 31-32 simple, articulated rays. Anal beginning behind origin of dorsal, with 29-30 rays. Pelvic projecting, supporting a small ventral flap. No movable pelvic spine. Caudal truncate. Scales very small with spinules directed backwards. Six branchiostegals.

Distribution that of the single species known.

Note. All authors cite: "Systema Balistidorum, etc." (Ned. Tijdschr. Dierk. III, 1866, p. 13) as Bleeker's first description of the genus *Oxymonacanthus*, but although it probably was written before, it was published after Vol. V of the Atlas Ichthyologique.

1. **Oxymonacanthus longirostris** (Bl. Schn.) (Fig. 76, p. 336)

Balistes hispidus var. *longirostris* Bloch Schneider, Syst. Ichth. 1801, p. 464.
Monacanthus longirostris Cuvier, Règne Animal II, 1817, p. 152.
Monacanthus chrysospilos Bleeker, Nat. Tijdschr. Ned. Indië IV, 1853, p. 126.
Monacanthus longirostris Hollard, Ann. Sci. Nat. (4) II, 1854, p. 331.
Oxymonacanthus longirostris Bleeker, Atlas Ichth. V, 1865, p. 137.
Monacanthus longirostris Günther, Cat. Brit. Mus. VIII, 1870, p. 233.
Oxymonacanthus longirostris Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 365.
Monacanthus longirostris Günther, Fische der Südsee III, 1910, p. 450.
Oxymonacanthus longirostris Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 463.
Oxymonacanthus longirostris Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 460.
Oxymonacanthus longirostris Randall, Atoll Res. Bull. 47, 1955, p. 227, p. 228.

D^1. II. D^2. 31-32. A. 29-30. P. 11.

Height 2.9, 3.5 in length with caudal. Gill opening less than pupil, situated behind eye, its distance from tip of snout 2.7, 3.3 in length with caudal. Eye 2.7 in snout. First dorsal spine above middle of eye, slightly shorter than snout, its anterior side with rows of barbs directed upwards, its posterior side with an alternating row of somewhat stronger but blunter barbs. Second dorsal spine inconspicuous. Anterior dorsal rays somewhat longer than posterior ones, about half length of first dorsal spine. Origin of anal below 7th dorsal ray, its longest rays slightly shorter than those of second dorsal. Pectorals as long as eye, their base behind and partly below gill opening. Pelvic covered with crowded spinules. Caudal short, truncate. Length of short caudal peduncle 2.6 in its depth. Scales very small, with spinules directed backwards, elongate and hairy on those of caudal peduncle. Colour of preserved specimens light bluish grey. Longitudinal yellowish bands on snout, rows of yellowish round blotches, encircled with dark bluish grey on body and tail.

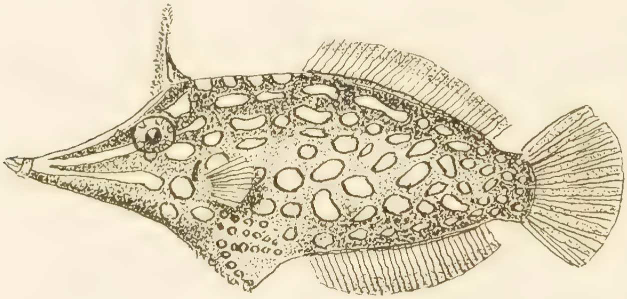

Fig. 76. *Oxymonacanthus longirostris* (Bl. Schn.) After Bleeker.

Length 100 mm. (A specimen of Bleeker's collection in the Amsterdam Museum examined).

Habitat: Batu Islands; Java; Bawean; Celebes (Menado); Buru; Ceram; Ambon; Island Serbete! — Mauritius, Philippines, Guam, New Britain, Solomon Islands, New Caledonia, Queensland, New Hebrides, Gilbert Islands, Fiji, Rotuma, Samoa, Tonga Islands.

3. **Alutera** Cuvier Oken

(Les Alutères, Cuvier, Règne Animal 1817, p. 153. — *Alutera* Oken, Isis, 1817)
Osbeckia Jordan & Evermann, Checklist Fishes N. America, 1896, p. 424.

Body elongate, strongly compressed, covered with minute scales, the skin smooth at touch. Mouth small, lips thin. Teeth much compressed, thin blades, in two rows, pointed, the labial ones in the upper jaw elongate, not pointed, scale-like. Gill opening an oblique slit, the posterior upper end below eye, the anterior, lower end before eye. First dorsal with II spines, the anterior one slender, of variable length, rough in adults, with spinules along its anterior and posterior border in young ones. Second dorsal spine minute, often hidden below the skin. Second dorsal with 43-50 rays, anal with 47-53 rays. All rays simple and feebly articulated. Pectorals below gill opening, their rays simple and more or less articulated. Pelvic hidden below the skin, without spine. Caudal rounded, the rays forked. Twenty one vertebrae.

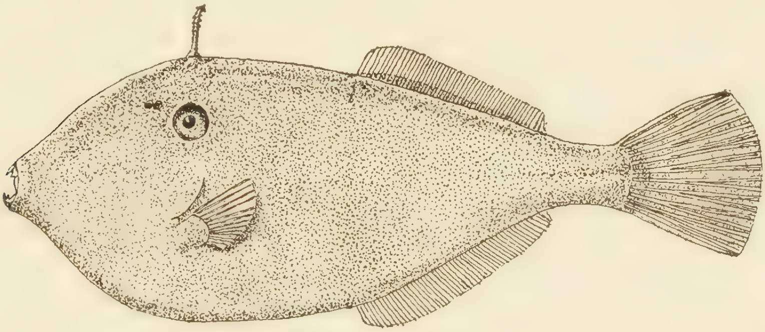

Fig. 77. *Alutera monoceros* (L.). × 5/6.

Distribution: A few species from the tropical Atlantic, Indic, and Pacific.

Key to the Indo-Australian species of Alutera

a. Profile of snout convex. Caudal much shorter than snout . . . . 1. *A. monoceros* p. 338.
b. Profile of snout concave, Caudal much longer than snout . . . . 2. *A. scripta* p. 339.

1. **Alutera monoceros** (Osbeck, L.) (Fig. 77, p. 337)

Balistes monoceros Osbeck, Iter Chinensis, 1757, p. 110.
Balistes monoceros Linné, Syst. Nat. ed. 10. 1, 1758, p. 327.
Balistes serraticornis Frémiville, Nouv. Bull. Sci. Soc. Philom. No. 67, 1813, p. 249.
Aluteres Berardi Lesson, Voyage Coquille, Zool. I. 1e Partie, 1830, p. 108.
Aleuteres berardi Richardson, Voyage Sulphur, Fishes, 1844, p. 132.
Alutera cinerea Schlegel, Fauna Japonica, Poissons, 6, 1850, p. 292.
Alutarius obliteratus Cantor, Journ. Asiat. Soc. Bengal XVIII, Part II (1949) 1950, p. 1335.
Alutarius macracanthus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 22.
Alutarius amphacanthoides Bleeker, ibid. p. 23.
Aluteres monoceros Bleeker, Atlas Ichth. V, 1865, p. 140.
Aleuteres monoceros Günther, Fishes of Zanzibar, 1866, p. 136.
Monacanthus monoceros Günther, Cat. Brit. Mus. VIII, 1870, p. 251.
Monacanthus monoceros Day, Fishes of India, Part 4, 1878, p. 693.
Alutera monoceros Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 274.
Alutera monoceros Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 423.
Alutera monoceros Jordan & Seale, ibid. XXVI (1906) 1907, p. 36.
Monacanthus monoceros Günther, Fiche der Südsee III, 1910, p. 452.
Alutera monoceros Snyder, Proc. U. S. Nat. Mus. XLII, 1912, p. 423.
Alutera monoceros Jordan & Jordan, Mem. Carnegie Mus. X, 1922-1925, p. 86.
Alutera monoceros Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 465.
Alutera monoceros Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 960.
Alutera monoceros Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 461.
Aluteres monoceros Whitley, Rec. Austr. Mus. XVII, No. 3, 1929, p. 142.
Aluteres monoceros J. L. B. Smith, Rec. Albany Mus. IV, 1935, p. 361.
Alutera cinerea Boeseman, Fishes coll. Burgers and v. Siebold, 1947, p. 210 (as synonym of *A. monoceros*).
Alutera monoceros J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 405.
Alutera monoceros Munro, The marine and fresh water fishes of Ceylon, 1955, p. 275.

D^1. I (II). D^2. 48-50. A. 50-51. P. 14-15.

Profile of head convex. Height 2.64, 3.05 in length with caudal. Gill opening very oblique, its posterior end below middle of eye, the distance between its anterior end and point of snout 4.1 in length without caudal. Eye 4.16-5.6 in snout. First dorsal spine situated above middle of eye, comparatively longer and provided with spinules anteriorly and posteriorly in young specimens, rough in old specimens; its distance from origin of second dorsal equal to snout or somewhat shorter. Second dorsal spine minute, hidden. Base of second dorsal equal to snout and eye. All rays simple and feebly articulated; the longest rays longer than eye. Origin of anal below that of second dorsal, its posterior end slightly behind vertical through end of second dorsal. Least depth of caudal peduncle 1.37-1.4 in its length. Mouth small terminal. Teeth near symphysis in both jaws long, flat, and pointed, the lateral ones, specially those of the upper jaw, much longer than deep. Origin of pectorals below middle of eye and below middle of gill opening, longer than eye. Caudal slightly rounded, much shorter than snout. Colour of preserved specimens brown, fins lighter. Length 335 mm.

Habitat: Sumatra (Priaman); Banka; Java (Jakarta, Samarang!); Celebes (Menado); Sumba!; Batjan; Ambon; Ceram!; New Guinea. — Coast of S. and E. Africa, Muscat, Réunion, coasts of India, Ceylon, Andamans, Siam, China, Riu Kiu Islands, Japan, Formosa, Malay Peninsula, Philippines, Pelew Islands, Australia, Lord Howe Island, eastwards to Hawaii. Tropical Atlantic?

2. **Alutera scripta** (Osbeck, L. Gmelin)

Balistes scriptus Osbeck, Iter Chinensis, 1757, p. 144.
Balistes monoceros var. *scriptus* Linné, Gmelin, Syst. Nat. ed. 13. 1788, p. 1463.
Balistes laevis Bloch, Ausländ. Fische IX, 1795, p. 82.
Aleutcres laevis Richardson, Voyage Sulphur, Fishes, 1844, p. 131.
Alutarius laevis Cantor, Journ. Asiat. Soc. Bengal XVIII, Part 2 (1849) 1850, p. 1337.
Alutarius laevis Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 21. — Nat. Tijdschr. Ned. Indië III, 1852, p. 304.
Aluteres scriptus Bleeker, Atlas Ichth. V, 1865, p. 141.
Monacanthus scriptus Günther, Cat. Brit. Mus. VIII, 1870, p. 252.
Monacanthus scriptus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 632.
Monacanthus scriptus Day, Fishes of India, Part 4, 1878, p. 694.
Osbeckia scripta Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 276.
Osbeckia scripta Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 422.
Alutera (Osbeckia) scripta Steindachner, Sitzber. Akad. Wien CXV, 1906, p. 1414 [1]).
Osbeckia scripta Evermann & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 100.
Monacanthus scriptus Günther, Fische der Südsee III, 1910, p. 452.
Osbeckia scripta Tanaka, Fishes of Japan IV, 1911, p. 63.
Osbeckia scripta Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 466.
Alutera scripta Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 961.
Alutera scripta Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 461.
Aluteres scriptus J. L. B. Smith, Rec. Albany Mus. IV, 1935, p. 363.
Osbeckia scripta J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 406.
Alutera scripta Munro, The marine and fresh water fishes of Ceylon, 1955, p. 275.

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1) The statement: "2.D.19" is apparently a misprint.

D^1. I (II). D^2. 45-47. A. 48-49. P. 14-15.

Profile of head concave. Height 3, 4.3 in length with caudal. Gill opening very oblique, its posterior end below middle of eye, the distance between its anterior end and point of snout 3.6-3.9 in length without caudal. Eye 3.6-4.5 in snout. First dorsal spine situated above hinder half of eye, provided with spinules anteriorly and posteriorly in young specimens, rough in old specimens, its distance from origin of second dorsal somewhat less than snout. Second dorsal spine minute. Base of second dorsal equal to snout and eye. Longest dorsal rays about equal to eye or longer. Origin of anal below that of second dorsal, its posterior end below that of second dorsal. Caudal peduncle about as deep as long. Mouth small, terminal. Chin slightly prominent. Teeth near symphysis in both jaws long, flat and pointed, the lateral ones in the upper jaw broader than high, scale-like. Origin of pectorals below posterior end of gill openings, longer than eye. Caudal long, acutely rounded, much longer than snout. Colour of preserved specimens brown with irregular black stripes and dots. Length 630 mm.

Habitat: Java (Jakarta, Tjiringin); Celebes (Tombariri); Sumbawa; Flores!; Solor; Halmahera; Ternate; Ambon!; Ceram; Banda; Guébé; Misol; Waigeu; Schouten Islands (Mysore); New Guinea (Manokwari, Hood Bay). — East coast of Africa, Seychelles, Mauritius, Red Sea, coasts of India, Ceylon, Penang, Formosa, Riu Kiu Islands, Korea, Japan, China, Philippines, Australia, E. and W. Pacific, tropical Atlantic.

4. **Pseudaluteres** Bleeker

(Bleeker, Atlas Ichthyol. V, 1865, p. 139)

Body elongate, compressed, covered with minute spiny scales. Mouth very small, terminal, lips thin. Gill opening an oblique slit, almost entirely behind eye. First dorsal with II spines, the anterior one slender, originating on snout well before eye, depressible in a dorsal groove. Second dorsal spine minute. Second dorsal with 46-49 rays, anal with 45-46 rays. All rays simple and feebly articulated. Pectorals behind gill opening. Caudal somewhat rounded. Pelvic hidden below the skin.

Distribution that of the single species known.

1. **Pseudaluteres nasicornis** (Schl.) (Fig. 78, p. 341)

Alutera nasicornis Schlegel, Fauna Japonica, 5, 1846, p. 223.
Alutarius nasicornis Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 352.
Aluteres nasicornis Hollard, Ann. Sci. Nat. IV, 1853, p. 19.

Aluteres nasicornis Montrouzier, Thiollière, Ann. Sci. phys. Soc. d'Agric. Lyon (2) VIII, 1856, p. 490.
Pseudaluteres nasicornis Bleeker, Atlas Ichth. V, 1865, p. 139.
Pseudalutarius nasicornis Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 273.
Monacanthus nasicornis Günther, Cat. Brit. Mus. VIII, 1870, p. 254.
Pseudaluteres nasicornis Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 277.
Pseudaluteres nasicornis Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 468.
Pseudaluteres nasicornis Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 460.
Pseudalutarius nasicornis T. Marshall, Dept. Harbour and Marine Queensl. Ichth. Notes No. 2, 1953, p. 61.

D^1. II. D^2. 46-49. A. 45-46. P. 10-12.

Profile of snout somewhat convex, more so in males than in females. Profile of back ascending in a straight line to second dorsal in females, with a slight convexity in males. Height between origin of second dorsal and anal 2.6-2.7, 3 in length with caudal. Gill opening oblique, about as long as eye, situated before base of pectorals and almost entirely behind vertical through hindborder of eye, its distance from tip of snout 4.1-4.27, 4.7-4.79 in length with caudal. Eye 2.5-2.6 in snout. First dorsal spine long and slender, longer than snout, densely covered with minute, pointed tubercles, depressible in a deep dorsal groove. Second dorsal spine minute. Second dorsal and anal rather low, the posterior anal rays slightly longer than the posterior dorsal rays and more than half length of first dorsal spine. Origin of anal below origin of second dorsal. Pectorals somewhat longer than eye. End of pelvic slightly or not protruding beyond ventral profile. No ventral flap. Caudal slightly rounded. Least depth of caudal peduncle 1.3-1.4 in its length. Scales with small spines directed tailwards, these spines longer and curved

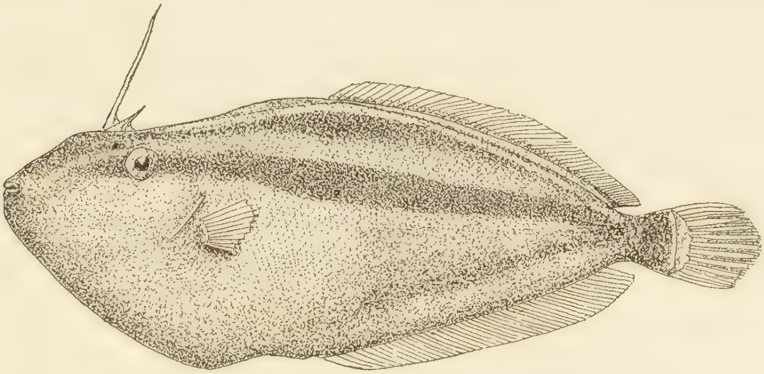

Fig. 78. *Pseudaluteres nasicornis* (Schl.) nat. size.

headwards in a patch on caudal peduncle in males. Colour of preserved specimens light brownish above, yellowish below. A brown band from eye to base of caudal. Fins yellow, median caudal rays brown. Length 120 mm.

Habitat: Borneo Bank!; Celebes (Menado); Buru; Ceram; Ambon; Aru Islands. — Zanzibar, Mauritius, Réunion, Maldives, Seychelles, Korea, Japan, Philippines, Woodlark Island, S. Queensland.

Note. This fish seems to live at moderate as well as at greater depths. Regan (Trans. Linn. Soc. London VII (3) 1908, p. 252) records specimens from 30 and 37 fathoms.

5. **Paraluteres** Bleeker

(Bleeker, Atlas Ichthyol. V, 1865, p. 138)

Somewhat elongate, not much compressed, belly slightly inflatable. Mouth terminal. Gill opening small, vertical, behind eye. First dorsal with the spine not fully erectile, enveloped in skin, without spinules or tubercles. Second dorsal spine inconspicuous. Second dorsal with 25-28 simple rays. Anal originating behind that of second dorsal, with 24 rays. Pelvic completely hidden below the skin, no pelvic shield, no pelvic spine. No ventral flap. Caudal slightly rounded. Scales small, with spinules, those of scales on tail longer and almost hairy. A double row of two strong spines on caudal peduncle.

Distribution that of the single species known.

1. **Paraluteres prionurus** (Blkr) (Fig. 79, p. 343)

Alutarius prionurus Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 260. — Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 20.

Alutarius prionurus Hollard, Ann. Sci. Nat. (4) II, 1854, Pl. 14, fig. 10. — Ibid. IV, 1855, p. 20.

Paraluteres prionurus Bleeker, Atlas Ichth. V, 1865, p. 138.

Monacanthus prionurus Günther, Cat. Brit. Mus. VIII, 1870, p. 234.

Paraluteres prionurus Jordan & Fowler, Proc. U. S. Nat. Mus. XXV, 1902, p. 273.

Paraluteres prionurus M. Weber, Siboga Exp. Fische, 1913, p. 581.

Paraluteres prionurus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 460.

D^1. I (II). D^2. 25-28. A. 24. P. 11-12.

Dorsal profile ascending in a straight line from tip of snout to origin of first dorsal. Height, measured between origin of second dosrsal and origin of anal 2.2-2.3, 2.75-2.9 in length with caudal. Gill opening below hindborder of eye, slightly less than half eye, its distance from tip of snout 3.3-3.4, 4-4.1 in length with caudal. Eye high up, 2-2.85 in snout. Interorbital space almost flat, a median longitudinal ridge in its posterior half, leading to the origin of the first dorsal which is slightly behind eye. First dorsal spine slender, slightly curved, as long as snout. Second spine inconspicuous. Membrane of first dorsal reaching to origin of second dorsal. Anterior rays of second dorsal longest, somewhat shorter than first dorsal spine. Origin of anal behind that of second dorsal. Anal similar to second dorsal, but less deep. Pectorals below and slightly behind gill opening, somewhat longer than eye. Caudal slightly rounded. Scales with short spinules, minute and crowded on head and body, larger on tail, the spinules increasing in length posteriorly and well developed on caudal peduncle which has a double row, each of two long spines, bent tailwards, but the tips bent headwards. Colour of preserved specimens white or pinkish anteriorly, light brown posteriorly. The white part with small brown spots and two ocelli formed by a brown spot, surrounded at some distance by a brown circle, situated on each side of chin, slightly before vertical through anterior border of eye. Sometimes the white is covered with a dark honeycombed network. Back with four dark brown saddles, separated by narrow white bands; the first behind eye and below origin of first dorsal, the second below hinder part of first dorsal to below origin of second dorsal, the third below anterior half of second dorsal, the fourth below posterior half of second dorsal. The second and third saddles tapering downwards on sides and ending in a black blotch, which is oval at the end of the second and round at the end of the third saddle, lastnamed situated above origin of anal. Membrane of first dorsal with a brown blotch superiorly. Second dorsal and anal hyaline, caudal hyaline with two light brown subterminal longitudinal bands, united before the end of the fin by a curved band, hence forming a loop on the fin. Length 106 mm.

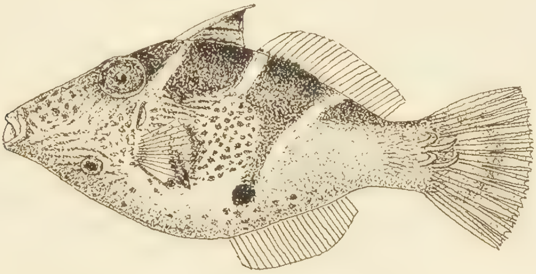

Fig. 79. *Paraluteres prionurus* (Blkr) nat. size.

Habitat: Ambon; Nusa laut!; Banda; New Guinea (Hood Bay). — Réunion!, Japan, New Hebrides.

6. **Psilocephalus** Swainson

(Swainson, Nat. Hist. Fishes II, 1839, p. 327)

Anacanthus Gray, Zool. Misc. 1831, p. 8 (preoccupied).
Pogonognathus Bleeker, Journ. Ind. Arch. III, 1849, p. 73.

Very elongate, much compressed, snout long, pointed, the small mouth dorsal. A fleshy barbel on chin. Gill opening before eye. First dorsal consisting of a short thread-like flexible ray, above hind-margin of eye. Second dorsal with 48-50 simple rays. Anal beginning somewhat before origin of second dorsal, with 58-62 simple rays. Pelvis very slender and feeble, hidden beneath the skin, supporting a small ventral flap in males. Caudal longer than head, pointed. Scales minute, skin velvety on touch. Three branchiostegals.

Distribution that of the single species known.

1. **Psilocephalus barbatus** (Gray) (Fig. 80, p. 344)

Anacanthus barbatus Gray, Zool. Misc. 1831, p. 8.
Psilocephalus barbatus Swainson, Nat. Hist. Fishes I, 1839, p. 327.
Pogonognathus barbatus Bleeker, Journ. Ind. Arch. III, 1849, p. 73. — Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Balistini, p. 24.

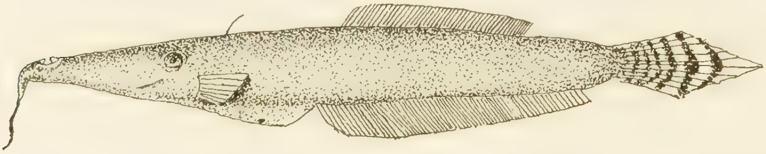

Fig. 80. *Psilocephalus barbatus* (Gray). × 2/3.

Alutarius barbatus Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850, p. 1339.
Aluterus barbatus Hollard, Ann. Sci. Nat. IV, 1855, p. 17.
Psilocephalus barbatus Bleeker, Atlas Ichth. V, 1865, p. 143.
Anacanthus barbatus Günther, Cat. Brit. Mus. VIII, 1870, p. 255.
Anacanthus barbatus Day, Fishes of India, Part IV, 1878, p. 694.
Anacanthus barbatus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 267.
Psilocephalus barbatus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 470.
Anacanthus barbatus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 276.

D^1. I. D^2. 48-50. A. 58-62. P. 8-10.

Height measured between origin of anal and base of second dorsal 10.8, 14 in length with caudal. Gill opening about as long as eye, almost horizontal, its posterior end below frontborder of eye, the distance between its anterior end and tip of snout. 4.5, 5.4 in length with caudal. Chin barbel rather thick at base, tapering into a thread, its length about equal to half length of snout. Origin of pectorals slightly behind vertical through hindborder of eye, their length about two eye diameters. Colour of preserved specimens greyish brown, fins yellowish. Length over 300 mm. (A specimen of Bleeker's collection in the Amsterdam Museum examined).

Habitat: Singapore; Bintang; Celebes (Makassar); Aru Islands. — Coasts of India, Ceylon, Andamans, Penang, Philippines, Queensland, West Australia.

5. Family OSTRACIONTIDAE

Head and body encased in a carapace formed of large, juxtaposed, mostly hexagonal bony plates, leaving an anterior opening for the mouth, a small slit for the gill opening and a posterior opening for the caudal peduncle. The carapace is typically quadrangular in cross section, with a dorsal surface which may have a median dorsal ridge, separated by the lateral ridges from the right and left sides, which again are separated from the ventral surface by the pelvic ridges. Premaxillaries not protractile, firmly united with the maxillaries. Teeth not coalesced, about ten in each jaw. No spinous dorsal fin and no ventrals. Soft dorsal and anal with 9-10 rays.

Distribution: All tropical seas.

Note. Fraser-Brunner (Ann. Mag. Nat. Hist. (10) XVI, 1935, p. 313) has given a valuable account of this family. In a later paper (Ibid. (11) VIII, 1941, p. 306) he separated the *Aracanidae* from the *Ostraciontidae* and divided the *Ostraciontidae* in two subfamilies, the *Lectophrysinae* containing the Atlantic forms and the *Ostraciontinae* containing the Indo-Pacific forms, lastnamed having four genera. As the characteristics distinguishing these genera are based on the absence or presence of spines and the development of the ridges, and as it is known that many of these features are only developed during the postembryonic stage, I have considered them as subgenera. I have adopted the nomenclature Fraser-Brunner

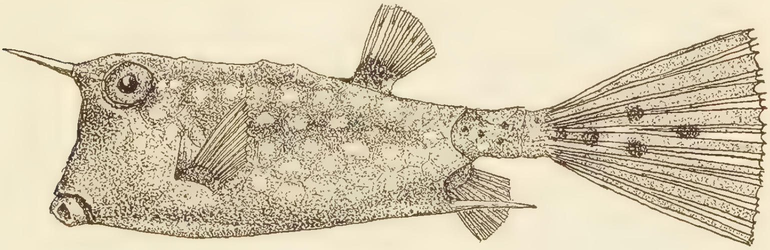

Fig. 81. *Ostracion cornutus* L. × ½.

proposed for the ridges without, however, taking position in the hypothesis attached by him to the name pelvic ridges.

1. **Ostracion** Linné

(Linné, Syst. Nat. ed. 10, I, 1758, p. 330)

Tetrosomus Swainson, Nat. Hist. Fishes II, 1839, p. 323.
Luctoria Jordan & Fowler. Proc. U.S. Nat. Mus. XXV, 1902, p. 278.
Rhynchostracion Fraser-Brunner, Ann. Mag. Nat. Hist. (10) XVI, 1935, p. 319.

Carapace closed behind the dorsal and the anal fin. Dorsal ridge generally low or absent, seldom prominent. Spines absent or present. Dorsal and anal with 9 rays, pectorals with 9-10 rays.

Distribution: Tropical parts of Indic and W. Pacific.

Key to the Indo-Australian species of Ostracion

I. A spine above eye directed upwards. Dorsal ridge with a high, compressed spine on back. Pelvic ridge with 5 spines, no spine at its posterior end (*Tetrosomus*) . . . . 1. *O. gibbosus* p. 347.

II. A spine above eye directed upwards. Dorsal ridge with two spines. Pelvic ridge with 3 spines, no spine at its posterior end (*Triorus*) . . . . 2. *O. reipublicae* p. 348.

III. A spine before eye, directed forwards. A spine at posterior end of pelvic ridge (*Lactoria*).
  a. A strong spine on elevated dorsal ridge. Spine at end of pelvic ridge strong, conical, broad based. Preocular spine short . . . . 3. *O. fornasini* p. 349.
  b. Dorsal ridge without spines or with a very feeble one. Spine at end of pelvic ridge slender. Preocular spine long. Caudal long, the rays bifurcate . . . . . 4. *O. cornutus* p. 350.
  c. Dorsal ridge with a short, compressed spine. Spine at end of pelvic ridge and preocular spine short. Caudal moderate, the rays plurifurcate . . . . 5. *O. diaphanus* p. 352.

IV. No spines.
  a. Dorsal ridge present. Snout projecting beyond mouth (*Rhynchostracion*).
    a^1. Anal behind dorsal. Dorsal ridge rather high. One dark spot on each bony plate . . . . 6. *O. nasus* p. 353.
    b^1. Anal partly below dorsal. Dorsal ridge low. Several dark spots on each bony plate . . . . 7. *O. rhinorhynchus* p. 354.
  b. Dorsal ridge absent or represented by a row of low tubercles before dorsal

(*Ostracion* s. str.).

a¹. P. 1.9.

  a². Length of anterior opening of carapace equal to or shorter than eye. Bony plates of body with a black spot, in adults with a white centre . . . . 8. *O. tuberculatus* p. 355.

  b². Length of anterior opening of carapace 1.6-1.9 diameters of eye. Back dark with many white spots. Sides with yellowish dark edged ocelli (males) or with white spots as on the back (females) . . . . 9. *O. meleagris* p. 356.

b¹. P. 1.8-9. Length of anterior opening of carapace about equal to eye (females) or 1.3-1.55 diameters of eye (males) . . . . 10. *O. solorensis* p. 358.

1. **Ostracion gibbosus** L.

Ostracion gibbosus Linné, Syst. Nat. Ed. X. 1758, p. 332.
Ostracion turritus Forskal, Descr. Animal. 1775, p. 75.
Ostracion turritus Bloch, Ausländ. Fische I, 1785, p. 113.
Ostracion turritus Bloch Schneider, Syst. Ichth. 1801, p. 500.
Ostracion turritus Bleeker, Verh. Bat. Gen. XXIV. 1852. Bijdr. kennis Ostraciones, p. 31.
Ostracion turritus Hollard, Ann. Sci. Nat. (4) VII, 1857, p. 156.
Ostracion (*Tetrosomus*) *turritus* Bleeker, Atlas Ichth. V, 1865, p. 31.
Ostracion gibbosus Günther, Cat. Brit. Mus. VIII, 1870, p. 258.
Ostracion turritus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 634.
Ostracion turritus Day, Fishes of India, Part IV, 1878, p. 695.
Ostracion gibbosum Jordan & Fowler, Proc. U.S. Nat. Mus. XXV, 1902, p. 279.
Ostracion gibbosum Jordan & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 36.
Ostracion gibbosum Franz, Abh. K. Bayer. Akad. Wiss. IV. Suppl. Bd. 1 Abh. 1910, p. 91 (sine syn.).
Lactophrys gibbosus J. L. B. Smith, Rec. Albany Mus. IV, 1935, p. 231.
Ostracion gibbosus Blegvad, Danish Inv. Iran, Part III, 1944, p. 215.
Tetrosomus gibbosus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 412.
Tetrosomus gibbosus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 276.

D. 1.8. A. 1.8. P. 3.7.

Height (without the dorsal spine) 2.2, 2.75 in length with caudal, and 1.3 in the breadth. Head 3.6, 4.5 in length with caudal. Eye 2.18, 1.5 in snout and 1.36 in concave interorbital space. No ventral ridge. Dorsal ridge forming on back, between head and dorsal, a high compressed ridge, ending in a compressed pointed spine. Lateral ridges rather feeble, much nearer to each other than the pelvic ridges, which have 5 well developed spines directed backwards and outwards, the first below gill opening, the last below dorsal. No spine at end of pelvic ridge. Lateral ridges continued anteriorly as supraorbital ridges which have a small spine, directed upwards and outwards. Back elevated, sides nearly flat, ventral surface somewhat concave. Profile of snout very oblique, almost vertical, scarcely concave. Gill opening small, almost vertical half diameter of eye behind vertical through hindborder of eye. Anterior opening of carapace small, longer than broad, the length less than eye. Lips rather thick. Teeth brown. The least depth of the caudal peduncle 1.1 in the length, measured from line connecting upper and lower ends of carapace; these ends pointed above, rounded below. Dorsal obliquely truncate, the anterior rays longest and 1.8 in head. Anal rounded, the median, longest rays 1.9 in head. Pectorals pointed, the upper and longest rays 1.5 in head. Caudal slightly rounded. Colour of preserved specimens brown. Length 225 mm.

Nomen indig.: Kapita.

Habitat: Java (Jakarta); Borneo; Celebes (Makassar); Buru; Ambon; Ceram; Aru Islands!; Misol.-Durban, Zanzibar, Red Sea and Suez Canal, Muscat, Aden, Persian Gulf coast of India, Andamans, Siam, Pulu Condor, Japan, Philippines, South Sea Islands?

2. **Ostracion reipublicae** (Ogilby)

Lactophrys reipublicae Ogilby, Mem. Queensl. Mus. II, 1913, p. 92.
Triorus reipublicae Whitley, ibid. X, Part 1, 1930, p. 27.

D. 1.8. A. 1.8. P. 1.10.

Height, excluding spines, 2.7 in total length. Profile steep, emarginate; snout pointed. Interorbital space markedly concave. A small spine over anterior third of eye. Carapace three-angled. Dorsal ridge convex, extending from interorbital space to dorsal fin and bearing two strong spines. Pedvic ridges with a prominent spine below and before the first dorsal spine and preceded by a small spine; another small spine below and before the origin of the dorsal fin; no spine below eye. Ventral surface convex anteriorly, flattened or slightly concave posteriorly. Carapace closed above and below tail; dorsally it ends as a rounded process but ventrally it is broadly truncate. Dorsal high, its margin rounded. Colour brown. Teeth dark brown. Length 150 mm (After Whitley, not seen by me).

Habitat: New Guinea (Papua). — Australia, Lord Howe Island.

Note. As I have not seen this species I have no opinion about the synnonymy recorded by Whitley, l.c.

3. **Ostracion fornasini** Bianconi

Ostracion fornasini Bianconi, Nuovi Ann. Soc. Nat. Bologna (2) V, 1846, p. 115.
Ostracion pentacanthus Bleeker, Acta Soc. Sci. Indo-Neerl. II, 1857. Achtste bijdr. kennis vischfauna Amboina, p. 98.
Ostracion (*Acanthostracion*) *Fornasini* Bleeker, Atlas Ichth. V, 1865, p. 34.
Ostracion fornasini Günther, Fishes of Zanzibar, 1866, p. 129. — Cat. Brit. Mus. VIII, 1870, p. 264, — Fische der Südsee III, 1910, p. 457.
Ostracion fornasini Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 963.
Ostracion fornasini Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 464.
Acanthostracion pentacanthus Whitley, Mem. Queensl. Mus. X, Part 1, 1930, p. 30.
Ostracion fornasini P. J. Schmidt, Trans. Pacif. Comm. Acad. Sci. U.S.S.R. II, 1931, p. 88.
Ostracion fornasini Fowler, Proc. Acad. Sci. Philadelphia 86, 1934, p. 510.
Lactoria fornasini J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 413.
Lactoria fornasini Munro, The marine and fresh water fishes of Ceylon, 1955, p. 276.

D. 1.8. A. 1.8. P. 1.9.

Height 2.28-2.38, 2.8-2.9 in length with caudal. Head 3.18-3.2, 3.9-4 in length with caudal. Eye 2.95-3.1, 2-2.1 in snout and 1.7-2.1 in concave interorbital space. Upper profile of snout straight with a slight concavity in its median part. No ventral ridge. A strong spine on middle of back at beginning of dorsal ridge which reaches dorsal. No spines on these ridges. Lateral ridge continued in swollen supraorbital ridge which ends in a short spine, slightly less than eye in length, directed forward and slightly upward. Pelvic spine about as long as dorsal spine. Back slightly convex, sides concave, ventral surface rounded. Gill opening vertical or almost so, its length 1.38 in eye. Anterior opening of carapace oval, its breadth 1.26 in its length. Lips thick. Sixteen brown teeth in the upper and 8 in the lower jaw. Upper and lower borders of posterior opening of carapace somewhat pointed tailwards, the lateral borders concave. Depth of caudal peduncle 1.3-1.5 in its length. Dorsal and anal somewhat rounded, the longest dorsal rays 1.86, the longest anal rays 2.16 in head. Pectorals rounded, the anterior rays longest and 1.6 in head. Caudal rounded, its rays branched. Colour of preserved specimens yellow, bluish white spots on sides of head, a bluish white stripe behind eye, similar oblique stripes on sides of carapace. Length 150 mm. Description made after two specimens, 110 and 123 mm total length, from Bleeker's collection in the Leiden Museum.

Habitat: Ambon!; New Guinea. — East coast of Africa as far south as Port Alfred, Mozambique, Zanzibar, Mauritius, Seychelles, Cargados Carajas, off Ceylon, Japan, Queensland, Lord Howe Island, Laysan, Pearl & Hermes Reef, Hawaii, New Zealand?.

Not. Günther (1910, l.c.) supposes that *fornasini* is the male of *diaphanus*.

4. **Ostracion cornutus** L (Fig. 81, p. 345)

Ostracion cornutus Linné, Syst. Nat. ed. 10. 1758, p. 331.
Ostracion cornutus Bloch, Ausländ. Fische I, 1785, p. 105.
Ostracion Valentini Bleeker, Journ. Ind. Arch. I, 1848, p. 639.
Ostracion cornutus Schlegel, Fauna Japonica, Pisces 6, 1850, p. 299.
Ostracion cornutus Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850, p. 1347.
Ostracion cornutus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Ostraciones, p. 32.
Ostracion cornutus Hollard, Ann. Sci. Nat. (4) VII, 1857, p. 158.
Ostracion (Acanthostracion) arcus Bleeker, Atl. Ichth. V, 1865, p. 35 (nec Bl. Schn.?).
Ostracion (Acanthostracion) arcus Kner, Novara Exp. Fische, 1865-1867, p. 404 (nec Bl. Schn.?).
Ostracion cornutus Peters, Monatsber. Akad. Wiss. Berlin (1868) 1869, p. 460.
Ostracion cornutus Günther, Cat. Brit. Mus. VIII, 1870, p. 265.
Ostracion cornutus L. Agassiz, Pisces Celebes, London, 1874, Tab. 5.
Ostracion cornutus Day, Fishes of India, Part IV, 1878, p. 697.
Ostracion cornutus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 270.
Ostracion cornutus Vaillant, Bull. Soc. Philom. Paris (7) XI, 1887, p. 52.
Ostracion cornutus Seale, Occas. Papers B. P. Bishop Mus. I, 1901, p. 118.
Ostracion cornutum Jordan & Fowler, Proc. U.S. Nat. Mus. XXV, 1902, p. 282.
Lactoria cornuta Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 368.
Ostracion cornutus Günther, Fische der Südsee III, 1910, p. 457.
Ostracion cornutus Franz, Abh. K. Bayer, Akad. Wiss. IV. Suppl. Bd. 1 Abh. 1910, p. 92.
Ostracion cornutus McCulloch, Austr. Zool. II, Part III, 1922, p. 127.
Ostracion cornutus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 476.
Ostracion cornutus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 963.
Ostracion cornutus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 464.
Ostracion cornutum P. J. Schmidt, Trans. Pac. Comm. Acad. Sci. U.S.S.R. I, 1930, p. 108.
Ostracion cornutus Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 426.
Ostracion cornutus Boeseman, Zool. Med. XXVIII, 1947, p. 213.
Lectoria cornutus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 413.
Lactoria cornuta Munro, The marine and fresh water fishes of Ceylon, 1955, p. 277.

D. 1.8 A. 1.8 P. 10.

Height 2.5, 3.8 in length with caudal (without the frontal horns). Head (without the frontal horns) 3.34, 5.1 in length with caudal (without the frontal horns). Eye 2.32, 1.68 in snout and 1.68 in the very concave interorbital space. No ventral ridge. Dorsal ridge with or without a very feeble spine on middle of back. Lateral and pelvic ridges rounded. Lateral ridge continued in the swollen supraorbital ridge which ends anteriorly in a long spine, directed forward and somewhat upward, as long as head in young ones, comparatively shorter in older specimens. A blunt, feeble spine on lateral ridge opposite spine of dorsal ridge. Pelvic ridge ending posteriorly in a long, slender spine, somewhat shorter than the frontal horn. Back almost flat, sides concave, ventral surface somewhat rounded. Profile of snout almost vertical with a slight concavity above mouth. Gill opening short, vertical, more than half eye diameter behind vertical through hindborder of eye. Anterior opening of carapace very small, somewhat longer than broad, its length 1.4 in eye. Lips thick. About 10 brown teeth in the upper jaw. Posterior end of carapace rounded above and below with the convexity in caudal direction, the sides rounded with the concavity in caudal direction. The least depth of the caudal peduncle equal to the length. Dorsal obliquely truncate, the anterior rays longest and 1.7 in head. Anal rounded, the longest rays slightly shorter than longest dorsal ray. Pectorals slightly rounded, the superior, longest ray as long as longest dorsal ray. Caudal slightly rounded, the rays bifurcate, very long and comparatively longer in adult specimens, where it may be as long as head and body. Colour of preserved specimens brown, most bony plates of head, back, and sides with a light blue spot. Length 455 mm.

Nomen indig.: Bantel tanduk.

Habitat: Singapore, Sumatra (Benkulen, Siboga); Raja Island!; Batu Islands; Nias; Bintang; Banka; Java (Jakarta!, Tjilatjap); Borneo (Sandakan); Bali; Saleyer!; Celebes (Makassar!, Badjoa, Menado); Ternate; Batjan; Obi; Buru; Ceram; Ambon!; Banda; Goram; Sumbawa; Sumba!; Solor; Timor; Letti; Kei Islands! Aru Islands!; Jobi; New Guinea (Rubi, Humboldt Bay!, Port Moresby). — Coasts of S. Africa as far south as Mossel Bay, Mozambique, Zanzibar Madagascar, Seychelles, Mauritius, Réunion, Cargados Caragos, Red Sea, Muscat, Gulf of Aden, coasts of India, Siam, Malay Peninsula, Cocos Keeling Islands, Pulu Condor, Annam, China, Formosa, Korea, Riu Kiu Islands, Japan, Philippines, Guam, Marcus Island, New Ireland, Solomon Islands, Queensland, New South Wales, West Australia, New Caledonia, Lord Howe Island, Fiji, Tonga Islands, Samoa, Society Islands, Tuamotu Islands, Marquesas Islands, Hawaii.

Note. For the development of the carapace, ridges, and spines in young ones see Günther, 1910, l.c.

5. **Ostracion diaphanus** Bl. Schn.

Ostracion diaphanus Bloch Schneider, Syst. Ichth. 1801, p. 501.
Ostracion brevicornis Schlegel, Fauna Japonica, Pisces 6, 1950, p. 297.
Lactophrys diaphanus Kaup, Arch. Naturgesch. 1855, p. 217.
Ostracion diaphanus Hollard, Ann. Sci. Nat. (4) 7, 1857, p. 157.
Ostracion diaphanus Bleeker, Acta Soc. Sci. Indo-Neerl. III, 1858. Vierde Bijdr. Kennis ichthyol. fauna Japan, p. 38.
Ostracion (Acanthostracion) cornutus Bleeker, Atlas Ichth. V, 1865, p. 33 (nec L.).
Ostracion diaphanus Günther, Cat. Brit. Mus. VIII, 1870, p. 264.
Ostracion diaphanus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 269.
Ostracion diaphanum Jordan & Fowler, Proc. U.S. Nat. Mus. XXV, 1902, p. 281.
Ostracion diaphanus Günther, Fische der Südsee III, 1910, p. 456.
Ostracion diaphanum Snyder, Proc. U.S. Nat. Mus. XLII, 1912, p. 424.
Ostracion diaphanus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1937, p. 963.
Ostracion diaphanus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 464.
Ostracion diaphanum P. J. Schmidt, Trans. Pac. Comm. Acad. Sci. U.S.S.R. I, 1930, p. 109.
Lactoria diaphana J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 413.

D. 1.8. A. 1.8. P. 10.

Height 2.57, 3.22 in length with caudal, 1.04 in the breadth. Head 3.9, 4.9 in length with caudal. Eye 2.58, 2 in snout and 1.9 in the very concave interorbital space. No ventral ridge. Dorsal ridge only developed on middle of back where it carries a compressed spine. Lateral and pelvic ridges rounded. The lateral ridge, ending anteriorly before eye in a short, blunt spine, directed forward, with a blunt spine opposite spine of dorsal ridge, disappearing in large specimens. Pelvic ridge ending posteriorly in a spine and in young ones with a spine opposite those of dorsal and lateral ridges, and another one between this spine and the terminal one. Back scarcely rounded, sides concave, ventral surface rounded. Profile of snout somewhat concave inferiorly, straight superiorly but convex in large specimens. Gill opening short, almost vertical, slightly behind vertical through hindborder of eye. Anterior opening of carapace small, longer than broad, the length scarcely more than one eye diameter. Lips rather thick. Posterior end of carapace rounded above and slightly rounded below, in both with the convexity in caudal direction, the sides rounded with the concavity in caudal direction. The least depth of the caudal peduncle 1.4 in its length, measured from line connecting posterior points of carapace above and below. Dorsal truncate, longest rays equal to snout. Anal rounded, longest rays about 1.5 in snout. Pectorals rounded, the longest rays almost as long as snout. Caudal rounded, as long as snout and eye. Colour of preserved specimens brown. Young specimens translucent. Length 314 mm.

Habitat: Ambon. — Cape of Good Hope, Natal, China, Riu Kiu Islands, Japan, Philippines, Solomon Islands, Queensland, New South Wales, Society Islands, Hawaii.

6. **Ostracion nasus** Bl.

Ostracion nasus Bloch, Ausländ, Fische I, 1785, p. 118.
Ostracion nasus Bloch Schneider, Syst. Ichth. 1801, p. 500.
Ostracion nasus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Ostraciones, p. 33.
Ostracion tesserula Cantor, Journ. Asiat. Soc. Bengal XVIII, Part 2 (1849), 1850, p. 1349.
Ostracion nasus Hollard, Ann. Sci. nat. (4) 7, 1857, p. 160.
Ostracion (Ostracion) nasus Bleeker, Atlas Ichth. V, 1865, p. 36.
Ostracion (Ostracion) nasus Kner, Novara Exp. Fische, 1865-1867, p. 404.
Ostracion nasus Günther, Cat. Brit. Mus. VIII, 1870, p. 263.
Ostracion nasus Day, Fishes of India, Pat IV, 1878, p. 696.
Lactophrys nasus Seale, Occas. Papers B. P. Bishop Mus. I, No. 3, 1901, p. 117.
Ostracion nasus Günther, Fische der Südsee III, 1910, p. 456.
Ostracion nasus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 463.
Rhynchostracion nasus Fraser-Brunner, Ann. Mag. Nat. Hist. (10) XVI, 1935, p. 319.
Rhynchostracion nasus Whitley, Austr. Zoologist XI, Part 1, 1945, p. 39.
Rhynchostracion nasus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 277.

D. 1.8. A. 1.8. P. 1.9.

Height 3.32-3.6, 4.4-4.5 in length with caudal. Head 4.27-4.38, 5.38-5.64 in length with caudal. Eye 3.1-3.3, 2.19-2.24 in concave interorbital space. Profile of snout concave, produced before mouth into a knob. Dorsal ridge beginning behind eye, the last part before dorsal very low. Lateral and pelvic ridges without any spines. Back on both sides of dorsal ridge concave. Sides and ventral surface concave. Anterior opening of carapace oval, its breadth 1.2-1.36 in its length, which is slightly more than eye. Lips thick. Twelve brown teeth in the upper jaw, 10 in the lower jaw. Least depth of caudal peduncle 1.5-1.8 in its length. Dorsal and anal slightly rounded, the longest dorsal rays 1.5-1.7, the longest anal rays 1.7-1.9 in head. Origin of anal behind end of dorsal. Pectorals rounded, the anterior, longest, rays 1.6-1.8 in head. Caudal rounded. Colour of preserved specimens yellowish brown, the sutures between the scutes darker; in life with a dark spot in the middle of each scute. Length 300 mm. (Specimens of Bleeker's collection in the Leiden Museum examined).

Habitat: Singapore; Banka; Java (Jakarta!); Ceram; Ambon; Mysore; New Guinea. — Coasts of India, Ceylon, Andamans, Siam, Cochin, Penang, Philippines, Pelew Islands, Marianas, Carolines, W. Australia, Queensland, St. Cruz Islands, New Hebrides, Fiji, Cook Islands, Society Islands, Marquesas Islands.

7. **Ostracion rhinorhynchus** Blkr

Ostracion nasus Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850, p. 1351 (nec Bl.).
Ostracion rhinorhynchus Bleeker, Verh. Bat. Gen. XXIV. 1852. Bijdr. kennis Ostraciones, p. 34.
Ostracion (*Ostracion*) *rhinorhynchus* Bleeker, Atlas Ichth. V, 1865, p. 37.
Ostracion rhinorhynchus Günther, Cat. Brit. Mus. VIII, 1870, p. 263.
Ostracion rhinorhynchus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 269.
Ostracion rhinorhynchus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 476.
Rhynchostracion rhinorhynchus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 278.

D. 1.8. A. 1.8. P. 1.9.

Height 3.1, 3.78 in length with caudal, and slightly less than breadth. Head 3.8, 4.6 in length with caudal. Eye 3.4, 1.9 in conical, produced snout, 2.9 in slightly concave interorbital space. Dorsal ridge low but well developed. Lateral and pelvic ridges sharp, without any spines .Snout produced into a conical prominence, the point of which is before mouth and about at a level with the hindborder of the eye. Besides the dorsal ridge is almost flat. Sides and ventral surface concave. Gill opening somewhat oblique, the lower end in vertical through hindborder of eye. Anterior opening of carapace oval, its length more than eye. Lips rather thick. Teeth dark brown. The least depth of the caudal peduncle 1.3 in its length, measured from rounded posterior end of carapace above and below. Dorsal and anal rounded, the longest rays about half length of head. Pectorals rounded, the superior longest rays almost as long as snout. Caudal rounded. Colour of preserved specimens yellowish, each scale with about 4 spots. Caudal peduncle, caudal, bases of dorsal and pectorals also spotted. Base of anal and ventral surface unspotted. Length 350 mm.

Habitat: Singapore; Biliton; Java (Jakarta, Japara); Duizend Islands; Borneo (Sandakan); Celebes (Makassar! Badjoa); Sulu Islands; Paternoster Islands!; Solor; Ceram; Aru Islands! — Ceylon, Penang, Philippines, Northern Territory and N. W. Australia.

8. **Ostracion tuberculatus** L

Ostracion tetragonus Linné, Museum Adolphi Friederici, 1754, p. 59.
Ostracion tuberculatus Linné, Syst. Nat. ed. 10. 1758, p. 331.
Ostracion cubicus Linné, ibid. p. 332.
Ostracion cubicus Bloch, Ausländ. Fische, I, 1785, p. 115. Tab. CXXXVII.
Ostracion cubicus Rüppell, Atlas Reise N. Afrika, 1928, p. 3.
Ostracion argus Rüppell, l.c.
Ostracion cubicus Bleeker, Journ. Ind. Arch. II, 1848, p. 639. — Verh. Bat. Gen. XXIV, 1952. Bijdr. kennis Ostraciones, p. 35.
Ostracion tesserula Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 305 (nec Cantor).
Ostracion cubicus Hollard, Ann. Sci. Nat. (4) 7, 1857, p. 162.
Ostracion (*Ostracion*) *tetragonus* Bleeker, Atlas Ichth. V, 1865, p. 39.
Ostracion (*Ostracion*) *tetragonus* Kner, Novara Exp. Fische, 1865-1867, p. 403.
Ostracion cubicus Günther, Cat. Brit. Mus. VIII, 1870, p. 260.
Ostracion cubicus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 635.
Ostracion argus Klunzinger, ibid. p. 636.
Ostracion cubicus Day, Fishes of India, Part IV, 1878, p. 696.
Ostracion cubicus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 268.
Ostracion tuberculatum Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 367.
Ostracion cubicus Günther, Fische der Südsee III, 1910, p. 453.
Ostracion tuberculatus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 474.
Ostracion tuberculatus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 962.
Ostracion cubicus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 461.
Ostracion tuberculatus Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 427.
Ostracion cubicus Meinken, Veröff. Deutsch. Kol. und Übersee-Museums, 1938, p. 175.
Ostracion tuberculatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 412.
Ostracion tuberculata Munro, The marine and fresh water fishes of Ceylon, 1955, p. 277.

D. 1.8. A. 1.8. P. 1.9.

Height 2.6-2, 3.4-4 in length with caudal, and 1.1-1.2 in the breadth. Head 3.54-3.8, 4.4-5.1 in length with caudal. Eye 2.5-3, 1.65-1.75 in snout and 2.25-2.67 in concave interorbital space. Dorsal and ventral ridges absent. Lateral and pelvic ridges rather sharp, without any spines. Profile of snout oblique, slightly concave, a hump before mouth, more developed in large specimens than in young ones. Back somewhat convex in cross section. Sides slightly concave, the pelvic ridges being more bent outwards in the middle than the lateral ridges. Ventral surface flat. Gill opening slightly oblique, its inferior end in vertical through hindborder of eye. Anterior opening of carapace longer than broad, its length equal to eye or somewhat shorter. Lips thick. Teeth dark brown. The least depth of the caudal peduncle 1.1-1.3 in its length, measured from the rounded posterior end of the carapace above. Dorsal and anal rounded, the longest dorsal rays 1.6-2 in head, the longest anal rays 1.8-2.2. Pectorals rounded, the longest rays 1.4-1.5 in head. Caudal rounded. Colour of preserved specimens brown or yellowish, black spots on head, more numerous than bony plates .Most bony plates of body with a black spot, or with two black spots connected by a milky white one; in adults the black encircles the white, forming ocelli. Spots on ventral surface black only. Bases of dorsal and pectorals, free portion of caudal peduncle and caudal usually with dark spots. Length 450 mm.

Nomen indig.: Buntel Kolak.

Habitat: Pulu Weh!; Singapore; Sumatra (Priaman); Batu Islands; Java; Celebes (Menado); Sumbawa; Flores; Solor; Letti; Ternate Buru; Ceram; Ambon!; Saparua, Banda!; Kei Islands!; Misol; Salawatti; New Guinea (Rubi, Fr. Wilhelms Hafen, Port Moresby). — East coast of Africa as far south as Knysna, Madagascar, Zanzibar, Seychelles, Mauritius, Red Sea and Suez Canal, Muscat, Aden, coasts of India, Ceylon, Siam, Cocos Keeling Islands, Pulu Condor, Hongkong, Riu Kiu Islands, Japan?, Philippines, Marianas, Marcus Island, Marshall Islands, Carolines, Admirality Islands, St. Matthias, New Britain, Solomon Islands, Woodlark Island, N. Queensland, New Hebrides Lord Howe Island, Marshall Islands, Rotuma, Kingsmill Islands, Fiji, Samoa, Cook Islands, Austral Islands, Society Islands, Tuamotu Islands, Marquesas Islands, Fanning Island, Hawaii.

9. **Ostracion meleagris** Shaw

Ostracion meleagris Shaw, Nat. Miscell. VII, 1796, pl. CCLIII.
Ostracion lentiginosus Bloch Schneider, Syst. Ichth. 1801, p. 501.
Ostracion punctatus Bloch Schneider, l.c.
Ostracion meleagris Shaw, Gen. Zool. V, Part II, 1804, p. 428.
Ostracion Sebae Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 259. — Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Ostraciones, p. 34.
Ostracion punctatus Bleeker, Nat. Tijdschr. Ned. Indië XI, 1856, p. 108.
Ostracion punctatus Hollard, Ann. Sci. Nat. (4) 7, 1857, p. 165.
Ostracion bombifrons Hollard, ibid. p. 168.

Ostracion (*Ostracion*) *punctatus* Bleeker, Atlas Ichth. V, 1865, p. 39.
Ostracion (*Ostracion*) *Sebae* Bleeker, ibid. p. 41.
Ostracion bombifrons Günther, Fishes of Zanzibar 1866, p. 130.
Ostracion (Ostracion) punctatus Kner, Novara Exp. Fische, 1865-1867, p. 403.
Ostracion sebae Günther, Cat. Brit. Mus. VIII, 1870, p. 261.
Ostracion punctatus Günther, l.c.
Ostracion punctatus Day, Fishes of India, Part IV, 1878, p. 696.
Ostracion camurum Jenkins, Bull. U.S. Fish. Comm. XX (1899) 1901, p. 396.
Ostracion punctatus Seale, Occas. Papers B. P. Bishop Mus. I, 1901, p. 118.
Ostracion oahuensis Jordan & Evermann, Bull. U.S. Fish. Comm. XXII (1902) 1903, p. 200.
Ostracion oahuensis Jenkins, ibid. p. 487.
Ostracion sebae Jordan & Evermann, ibid. XXIII (1903) 1905, p. 442.
Ostracion oahuensis Jordan & Evermann, ibid. p. 443.
Ostracion lentiginosum Jordan & Evermann, l.c.
Ostracion sebae Jordan & Snyder, Proc. U.S. Nat. Mus. XXVIII, 1905, p. 125.
Ostracion lentiginosum Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 367.
Ostracion sebae Jordan & Seale, l.c.
Ostracion oahuensis Jordan & Seale, l.c.
Ostracion sebae Günther, Fische der Südsee III, 1910, p. 454.
Ostracion punctatus Günther, l.c.
Ostracion punctatus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 962.
Ostracion sebae Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 462. — Proc. U.S. Nat. Mus. 80, 1932, p. 16.
Ostracion lentiginosum Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 462. — Monogr. Acad. Nat. Sci. Philadelphia 2, 1938, p. 246.
Ostracion lentiginosum J. L. B. Smith, The Sea Fishes of S. Africa. 2nd impress. 1950, p. 412.
Ostracion lentiginosa Munro. The marine and fresh water fishes of Ceylon, 1955, p. 277.
Ostracion meleagris Randall, Atoll Res. Bull. 47, 1955, p. 221.
Ostracion meleagris Rofen, The Nat. Hist. Rennell island I, no. 10, 1958, p. 204.

D. 1. 8. A. 1. 8. P. 1. 9.

Height 2.95-3.2, 3.65-3.9 in length with caudal, 1.1-1.3 in the breadth. Head 3.86-4, 4.77-4.9 in length with caudal. Eye 2.4-2.9, 2-2.6 in snout and 2.2-2.6 in the interorbital space which is almost flat in males, somewhat concave in females. No dorsal and no ventral ridges. Lateral ridges not sharp, pelvic ridges rather sharp. No spines. Back slightly rounded, sides concave, ventral surface scarcely rounded. Profile of snout straight or slightly rounded in males, concave in females. Gill opening somewhat oblique, its upper end slightly behind vertical through hindborder of eye. Anterior opening of carapace wide, oval, longer than broad, the length 1.6-1.9 diameters of eye. Lips thick. Teeth dark or light brown. The least depth of the caudal peduncle 1.1-1.2 in its length, measured from posterior rounded end of carapace above. Dorsal and anal slightly rounded, longest dorsal rays 1.6-1.76, longest anal rays 1.8-2 in head. Pectorals somewhat rounded, the anterior longest rays 1.4-1.46 in head. Caudal slightly rounded, almost truncate. Colour of preserved specimens brown or black; in males: back, upper part of free caudal peduncle and base of dorsal with numerous white dots; sides of body and tail and free part of caudal peduncle with yellowish, dark edged ocelli, much larger than the dots of the back. Ventral surface with or without similar ocelli. In females: head, body, tail, and free part of caudal peduncle and caudal fin with numerous white spots, smaller than those of the back of the males, those on the ventral surface partly confluent into sinuous white lines. Length 163 mm.

Habitat: Java; N. Celebes; Flores!; Ternate; Ceram; Ambon; Nusa Laut; Banda; Solor; Letti; Guébé; Misol; Salawatti; New Guinea. — East coast of Africa, as far south as False Bay, Zanzibar, Madagascar, Mauritius, Réunion, coasts of India, Ceylon, Siam, Pulu Condor, Philippines, Marianas, Carolines, Solomon Islands, Australia, Santa Cruz Islands, New Hebrides, New Caledonia, Kingsmill Islands, Fiji, Samoa, Cook Islands, Society Islands, Tuamotu Islands, Marquesas Islands, Jarvis Island, Thorton Island, Johnston Island, Hawaii.

Note. Fraser-Brunner ,Ann. Mag. Nat. Hist. (11) VI, 1940, p. 391) makes it very probable that *O. sebae* is the male of *O. meleagris* and hence I have followed him in uniting the two. It remains strange that *O. sebae* hitherto has not been found in Madagascar, Réunion, Mauritius, coasts of India and Ceylon, Siam, and Pulu Condor, hence practically in the entire area of the northern part of the Indic, where *meleagris* is known to occur.

10. **Ostracion solorensis** Blkr

Ostracion solorensis Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 96.
Ostracion Renardi Bleeker, Acta. Soc. Sci. Indo-Neerl. I, 1856. Beschr. vischsoorten Amboina, p. 68.
Ostracion (*Ostracion*) *Renardi* Bleeker, Atlas Ichth. V, 1865, p. 41.
Ostracion (*Ostracion*) *solorensis* Bleeker, ibid. p. 42.
Ostracion renardi Günther, Cat. Brit. Mus. VIII, 1870, p. 262. — Fische der Südsee III, 1910, p. 455.
Ostracion solorensis Günther, ibid. 1870, l.c. — Ibid. 1910, l.c.

D. 1. 8. A. 1. 8. P. 1. 8.

Female (*O. solorensis*). Height 2.5-2.8, 3.25-3.48 in length with caudal, 1.28 in the breadth. Head 3-3.56, 3.76-4.39 in length with caudal. Eye 2.6-2.9, 1.47-2.15 in snout and 1.66-2.3 in the slightly concave interorbital space. Dorsal ridge indicated by a row of very low, crowded tubercles before the dorsal fin. No ventral ridge. Lateral and pelvic ridges sharp. No spines. Back and ventral surface slightly convex, almost flat, sides concave. Gill opening very small, less than half eye, vertical, slightly behind vertical through hindborder of eye. Profile of snout somewhat concave. Anterior opening of carapace longer than broad, its length about equal to eye, least depth of caudal peduncle equal to its length, measured from upper posterior end of carapace. Dorsal ad anal slightly rounded, the longest dorsal rays 1.7-2.1, the longest anal rays 1.9-2.1 in head. Pectorals pointed, the anterior, longest, rays 1.4-1.7 in head. Caudal rounded. Colour of preserved specimens dark brown, sides of head and ventral surface light brown or yellowish. Back with numerous small light spots, confluent into light lines on interorbital space, these lines broadening on snout and enclosing dark spots. Similar spots but wider apart, on sides of head, on ventral surface and on base of anal. Two light longitudinal lines along upper half of sides, lower half of sides with similar but anastomosing lines ,giving a reticulated appearance to this part of the carapace. Free part of caudal peduncle with similar reticulations. Base of dorsal dark with light lines and spots. Basal half of caudal with small dark spots. Length 102 mm. Male (*O. renardi*). D. 1.8. A. 1.8. P. 1.8-1.9. Height 2.7-2.74, 3.35-3.26 in length with caudal, 1.06-1.09 in the breadth. Head 3-3.3, 3.8-4 in length with caudal. Eye 2.55-3.2, 1.85-2.44 in snout and 1.2-2 in the almost flat interorbital space. No dorsal and no ventral ridges. Lateral and pelvic ridges sharp. No spines. Back and ventral surface slightly convex or ventral surface flat, sides concave. Gill opening 1.6-2 in eye. Snout shorter and less pointed than in female, its upper profile scarcely concave. Anterior opening of carapace longer than broad, 1.3-1.55 times diameter of eye. Least depth of caudal peduncle 1.1-1.4 in its length. Dorsal and anal rounded, the longest dorsal rays 1.9-2, the longest anal rays 1.9-2.4 in head. Pectorals pointed, the anterior, longest, rays 1.59-1.7 in head. Caudal rounded. Colour of preserved specimens brown. A light bluish stripe, bordered on both sides with broad dark brown stripes, connecting eyes over forehead. A similar band on cheeks, vertically down from lower border of eye, bent at a right angle forward before gill opening and ending at some distance of mouth. A few similar, shorter stripes or rounded ocelli on throat. Another band running from hindborder of eye along sides of back to tail end of carapace, less distinct on tail and on posterior part of back. Back with or without numerous small white spots. Bony plates of carapace on sides of body and tail each with a light bluish centre, the sutures between the plates also light bluish. Free part of caudal peduncle with bluish spots and curved bluish stripes. Ventral surface with scattered, small, light bluish, dark edged ocelli. Proximal part of membrane of caudal blackish or with elongate black spots; distal part of this membrane with or without a few rounded black spots and a faint terminal dark band or row of spots. Length 111 mm. (Specimens of *O. solorensis* and *O. renardi* of Bleeker's collection in the Leiden Museum examined).

Habitat: Java; Flores; Solor; Buru; Ambon; Banda!; Misol.- Duke of York Island.

Note. Fraser-Brunner (Ann. Mag. Nat. Hist. (11) VI, 1940, p. 390) has shown that *O. renardi* is the male of *O. solorensis.*

The fish described by Fowler (Mem. B. P. Bishop Mus. X, 1928, p. 463) from Johnstone Island as *O. solorensis* is most probably a different species.

Doubtful species

Ostracion ornatus Guich. Hollard

Ostracion ornatus Hollard, Ann. Sci. Nat. (4) 7, 1857, p. 166.
Ostracion (*Ostracion*) *ornatus* Bleeker, Atlas Ichth. V, 1865, p. 38.
Ostracion ornatus Günther, Fische der Südsee III, 1910, p. 455.

This species, described from the Marquesas Islands, has never been found again. Günther, l.c., thought it possible that *O. chryseres* Seale could be the same species, but Fowler (Mem. B. P. Bishop Mus. X, 1928, p. 462) who examined the type of *chryseres,* ranges it among the synonyms of *O. cubicus* (= *tuberculatus*). Bleeker, l.c., supposed that the "Ican peti" from the Moluccas figured by Renard could be *O. ornatus* and hence that this species occurs in the Indo-Australian Archipelago, but this is very improbable.

Ostracion tricornis L.

Ostracion tricornis Linné, Syst. nat. ed. 10, 1758, p. 331.
Ostracion quadricornis Linné, ibid. p. 331.
Ostracion (*Acanthostracion*) *quadricornis* Bleeker, Atlas Ichth. V, 1865, p. 32.

This Atlantic species which has been found occasionally in the Indic, along the southeastern coast of Africa and at Réunion, has been recorded from Sumatra by Bennettt, according to Bleeker. As no specimens of this species ever have been found so far to the east, it is probable that Bennett made a mistake.

6. Family TRIODONTIDAE

Compressed, body covered with elongate osseous, spiny scales. Premaxillaries not protractile. Teeth coalesced, forming a beak with the jaws. The upper jaw with a median suture, the lower jaw without suture. A rudimentary first dorsal, consisting of a few flexible spines, hidden in a slit, may be present [1]). Second dorsal and anal rather short. Pelvic represented by a single long bone, supporting a large, compressed, pendant sac. No ventrals.

1. **Triodon** Lesson

Lesson, Zool. Coquille, Atlas, Pl. 4. 1829.

1. **Triodon macropterus** Lesson (Fig. 82, p. 362)

Triodon macropterus Lesson, Zool. Coquille, Atlas, Pl. 4. 1829, Tome 2, 1re partie, 1830, p. 103.

Triodon bursarius Cuvier, Règne Animal, Ed. II, Vol. I, 1829, p. 370.

Triodon bursarius Bleeker, Verh. Bat. Gen. XXIV. Bijdr. kennis blootk. visschen, 1852, p. 20. — Acta Soc. Indo-Neerl. VIII, 12de bijdr. kennis vischfauna Amboina, 1860, p. 1. — Atlas Ichth. V, 1865, p. 84.

Triodon bursarius Günther, Cat. Brit. Mus. VIII, 1870, p. 270.

Triodon bursarius Day, Fishes of India, Part IV, 1878, p. 698.

Triodon bursarius Jordan & Snyder, Proc. U.S. Nat. Mus. XXIV, 1901, p. 230.

Triodon bursarius Herre, Philipp. Journ. Sci. 27. No. 2, 1925, p. 168. — Notes Fish. Zool. Mus. Stanford Univ. 1931, p. 102.

Triodon bursarius J. L. B. Smith, Ann. Mag. Nat. Hist. (12) IV, 1951, p. 65.

D^1 0-II. D^2. I. 9-10. A. I. 8 (9). P. I. 14-15.

Head 3-3.2, 3.47-3.96 in length with caudal. Eye 3.59-4.6, 2-2.76 in snout and 1.3-1.7 in slightly concave interorbital space. Two nostrils, close together, on each side, nearer to eye than to end of snout. First dorsal, if present, consisting of two very short and feeble spines, hidden in a longitudinal black slit. Longest rays of second dorsal as long as snout. Anal totally behind second dorsal, the longest rays shorter than those of second dorsal and about equal to interorbital space. Pectorals rounded, the longest rays equal to or somewhat shorter than those of anal. Caudal deeply forked. Scales elongate, osseous and spiny. Colour of preserved specimens yellowish, including the fins. A large, rounded black blotch on upper part of sac, somewhat nearer or much nearer to base of pectorals than to base of anal. Length 460 mm.

Habitat: Sumatra; Ceram!; Haruko!; Ambon; Banda! —

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[1]) This is the first publication of the discovery of a spiny dorsal in *Triodon*. I hope to give more details in Copeia 1963.

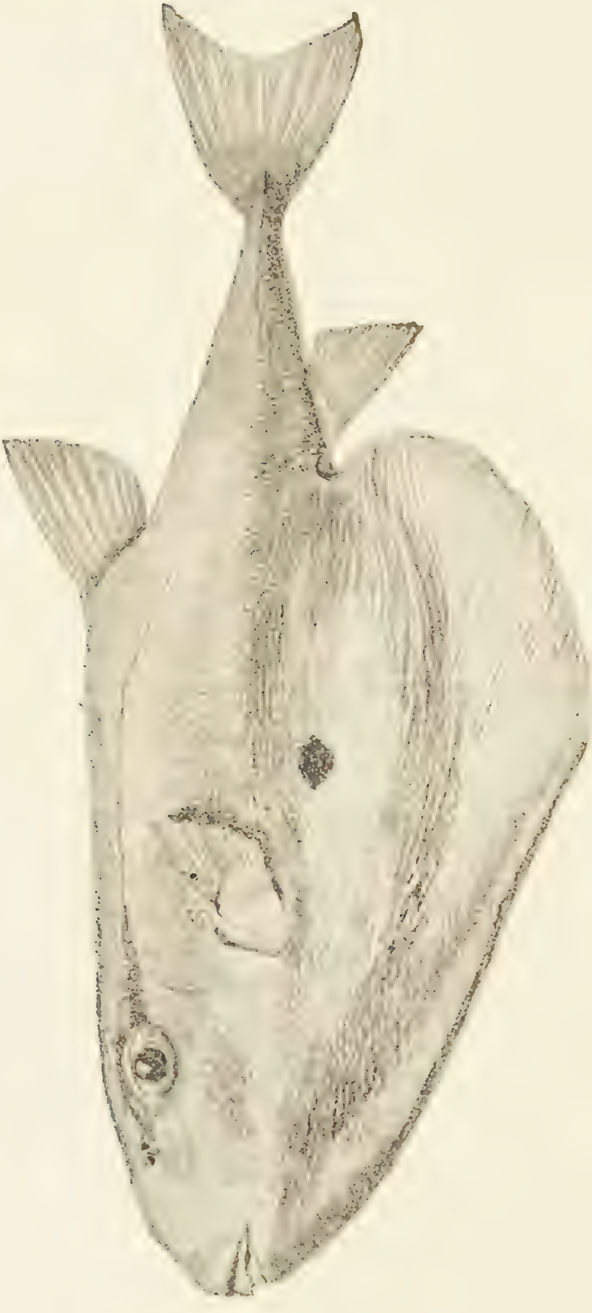

Fig. 82. *Triodon macropterus* Lesson. × ½.

Coast of East Africa (Inhambane), Mauritius, Seas of India, Japan, Korea, Pulu Condor, Philippines.

Note. For the nomenclature of this species see Boeseman, Zool. Meded. Leiden XXXVIII, no. 4. 1962, p. 77.

7. Family Tetraodontidae

Body inflatable, globular in inflated condition. Skin with more or less regularly arranged spines, generally restricted to some parts of the fish, leaving the other parts naked. Teeth coalesced, forming a beak with the jaws, each jaw with a median suture. No spinous dorsal. No ventrals. Caudal present. Nasal organs either two nostrils on each side, situated in an oval nasal area, or the nasal area raised up into a tubular papilla bearing the two nostrils. In the last case the nostrils may be confluent into one and the nasal organ appears as a circular tube produced terminally into two more or less distinct tentacles. This tube may be short and constricted, so that the nasal organ appears as two tentacles, joined at their bases. In one genus (*Canthigaster*) the circular tube has degenerated to an incospicuous rim with a minute aperture. In another genus (*Chelonodon*) the rim of the circular tube is developed into two large flaps.

Key to the Indo-Australian genera of Tetraodontidae

A. Back carinate. Nasal organ a minute aperture in an inconspicuous rim . . . . 1. *Canthigaster* p. 363.
B. Back rounded.
  a. Dorsal with 25-38 rays. Anal with 23-33 rays. Nasal organ a depression surrounded by a high rim . . . . 2. *Chonerhinus* p. 373.
  b. Dorsal with 8-19 rays, anal with 9-12 rays.
    a^1. Nasal organ a more or less elevated hollow papilla, pierced by two openings . . . 3. *Sphoeroides* p. 375.
    b^1. Nasal organ a depression surrounded by a low rim, produced into a posterior and an anterior flap. Sides naked . . . . . . 4. *Chelonodon* p. 389.
    c^1. Nasal organ a single or bifid elevated tube. Sides with prickles . . . . 5. *Tetraodon* p. 391.

1. **Canthigaster** Swainson

(Swainson, The Nat. Hist. of Fishes II, 1839, p. 194)

Psilonotus Swainson, ibid. p. 328.
Tropidichthys Bleeker, Nat. Tijdschr. Ned. Indië VI, 1854, p. 501.
Anosmius Peters, Monatsber. Akad. Wiss. Berlin, 1855, p. 274.

Compressed, back with a median, longitudinal ridge. Snout long, pointed. Nasal organ a shallow depression of the skin in front of the eye, often inconspicuous. No lateral lines. Small spines generally cover head, body, and tail. Dorsal with 9-12 rays. Anal with 9-12 rays, its origin behind dorsal. Pectorals more or less fan-like. Caudal truncate or rounded.

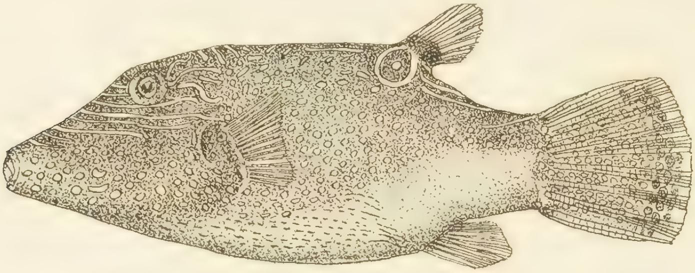

Fig. 83. *Canthigaster margaritatus* (Rüppell). nat. size.

Distribution: Red Sea, tropical parts of Indic and western Pacific.

Key to the Indo-Australian species of Canthigaster

A. D. 11-12. A. 10-11. Head, body and tail with black blotches and spots. Bases of dorsal, anal and pectorals black . . . . 1. *C. amboinensis* p. 365.
B. D. 9 (10). A. 9.
  a. Dark cross bands on back, more or less descending on sides . . . . 2. *C. valentini* p. 366.
    b. No dark cross bands, A dark ocellus at base of dorsal.
      a¹. Caudal, as well as sides of body and tail covered by blue ocelli. Caudal peduncle deeper than long . . . . 3. *C. margaritatus* p. 367.
      b¹. Caudal uniform, head, body and tail with blue ocelli. Caudal peduncle longer than deep . . . . 4. *C. bennetti* p. 369.
      c¹. Caudal uniform, sides light with dark reticulations. Caudal peduncle longer than deep. . . . . 5. *C. janthinopterus* p. 371.
      d¹. Caudal with narrow, brown, vertical stripes. Sides with light vermiculating lines. Caudal peduncle as deep as long. 6. *C. compressus* p. 371.

1. **Canthigaster amboinensis** (Blkr)

Psilonotus amboinensis Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 180.
Canthogaster amboinensis Bleeker, Atlas Ichth. V, 1865, p. 79.

Tetrodon amboinensis Günther, Cat. Brit. Mus. VIII, 1870, p. 302.
Tropidichthys oahuensis Jenkins, Bull. U.S. Fish. Comm. XXII (1902) 1904, p. 485.
Canthigaster oahuensis Jordan & Evermann, ibid. XXIII (1903) 1905, p. 432.
Canthigaster psegma Jordan & Evermann, ibid. p. 433.
Canthigaster psegma Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 372.
Canthigaster amboinensis Steindachner, Sitzber. Akad. Wien CXV, 1906, p. 1414.
Tetrodon amboinensis Günther, Fische der Südsee III, 1910, p. 472.
?*Tropidichthys natalensis* Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 976.
Canthigaster amboinensis Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 465.
Canthigaster amboinensis Duncker & Mohr, Mitt. Zool. Mus. Hamburg 44, 1929, p. 79.
Canthigaster amboinensis J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 421.
Canthigaster amboinensis Randall, Atoll Res. Bull. 47, 1955, p. 233.

D. I. 10-I. 11. A. I. 9 (10). P. 14-15.

Height 1.97-2, 2.43-2.44 in length with caudal. Head 2.78-3.2, 3.3-3.96 in length with caudal. Eye 4, scarcely interfering with upper profile of head, 2.4-2.66 in snout and 1.4-1.58 in slightly concave interorbital space. Nostrils minute depressions with a circular rim. Short, distant spines on head, inconspicuous on body and tail. A dorsal ridge on middle of back, from posterior part of interorbital space to elevated base of dorsal. No lateral lines. Dorsal and anal rounded, longest dorsal rays twice, longest anal rays 2.4 in head. Longest pectoral rays 1.92 in head. Caudal slightly rounded. Length of caudal peduncle 1.16-1.25 in its depth. Colour of preserved specimens blackish, belly lighter. Sides of snout with numerous parallel, oblique, dark stripes, light blue in life, dissolved into spots on cheeks. Similar stripes radiating from eye. Back and sides of body and tail with white spots, blue in life. Larger black spots on sides below and behind pectorals. Bases and posterior rays of dorsal, anal, and pectorals black. Caudal dark, uniform. Length 250 mm. (A specimen of Bleeker's collection in the Leiden Museum examined).

Habitat: Ambon!; New Guinea. — Natal?, Seychelles?, Japan, Philippines, Gilbert Islands, Fiji, Samoa, Hawaii.

Note. Günther (1870, l.c.) described a variety *natalensis* of *amboinensis* from Natal as follows: "The sides of the head in front of the pectoral fin ornamented as the body; cheeks with short horizontal and vertical bluish lines. Basal half of the caudal fin spotted like the body".

Regan (Trans. Linn. Soc. London XII, Part 3, 1908, p. 253) records "*Tropidichthys natalensis* Gthr." from the Seychelles without any comment. Barnard (l.c.) supposes *natalensis* to be only a variety of *amboinensis,* and J. L. B. Smith (l.c.) unites the two and says that *amboinensis* "was found at Durban 80 years ago, not since recorded". More material is wanted to decide if *natalensis* is a western subspecies of *amboinensis.*

Fowler (l.c.) mentions among the synonyms of *amboinensis*: "*Leiodon patoca* Bleeker: Akad. Amsterdam, Verslagen, 2nd ser. vol. 2, p. 298, 1868 (Waigiu)". In the paper cited Bleeker records this species in a list of fishes collected by Bernstein. Probably Fowler's citation got in the wrong place during printing.

2. **Canthigaster valentini** (Blkr)

Tetraodon Valentini Bleeker, Nat. Tijdschr. Ned. Indië IV, 1853, p. 130.
Tetrodon taeniatus Peters, Monatsber. Akad. Wiss. Berlin 1855, p. 462.
Psilonotus Valentyni Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 272. — Atlas Ichth. V, 1865, Tab. CCVIII, fig. 1.
Canthogaster Valentyni Bleeker, Atlas Ichth. V, 1865, p. 80.
Tetrodon valentyni Günther, Fishes of Zanzibar, 1866, p. 132.
Tetrodon valentini Günther, Cat. Brit. Mus. VIII, 1870, p. 305.
Canthigaster cinctus Jordan & Evermann, Bull. U.S. Fish. Comm. XXIII (1903) 1905, p. 433 (nec Solander, Richardson).
Canthigaster cinctus Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 373 (nec Solander, Richardson).
Tetrodon valentini Günther, Fische der Südsee III, 1910, p. 474.
Canthigaster cinctus Tanaka, Fishes of Japan V, Tokyo, 1912, p. 76 (nec Solander, Richardson).
Tropidichthys Valentini M. Weber, Siboga Exp. Fische, 1913, p. 587.
Canthigaster cinctus McCulloch, Mem. Queensl. Mus. VIII, Part IV, 1922, p. 245 (nec Solander, Richardson).
Canthigaster valentini McCulloch, l.c.
Tropidichthys cinctus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 976.
Canthigaster cinctus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 466 (nec Solander, Richardson).
Canthigaster valentini Abe, Bull. Biogeogr. Soc. Japan 14, No. 1, 1949, p. 3, p. 4.
Canthigaster valentini J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 420.

D. 1. 8. A. 1. 8. P. 2. 14.

Head 2.47-2.5, 2.8-3.3 in length with caudal. Eye high, interfering with upper profile of head, 3.8-4.6, 2.4-3 in snout and 1.18-1.4 in concave interorbital space. Nostrils small depressions with a low rim, one eye diameter in front of eye. Head, body, and tail covered with small spines. Dorsal ridge developed from posterior part of interorbital space to origin of dorsal. No lateral lines. Dorsal truncate or slightly rounded, the anterior rays longest and 2.5-2.6 in head. Anal slightly rounded, the longest rays 2.8-3 in head. Origin of anal slightly behind dorsal. Pectorals truncate, the longest rays 2.6-2.8 in head. Caudal slightly rounded, almost truncate. Least depth of caudal peduncle 1.1 in its length, measured from anal. Colour of preserved specimens very light brown or creamy, sometimes with a bluish tinge on sides of tail. Dark brown cross bands on back, the first through posterior part of interorbital space and hindborder of eye, the dark colour sometimes extending on upper part of snout. The second, much broader band to base of pectoral, the third before dorsal, tapering inferiorly and ending on middle of side, the fourth forming a saddle on caudal peduncle. The bands are separated by rather narrow bluish bands, not always visible in preserved specimens. A dark brown, oblique stripe below base of pectoral, more or less in contact with the inferior end of the second band on back. Sides of head, body, and caudal peduncle with brown spots. Fins uniform yellowish, but the caudal margined with blackish above and below. Length 200 mm.

Habitat: Palawan!: Solor; Ambon!; Ceram; Kei Islands!; New Guinea (Hood Bay). — Delagoa Bay, Mozambique, Zanzibar, Seychelles, Mauritius, Réunion, Maldives, Muscat, Gulf of Aden, Philippines, Japan, Bonin Island, Pelew Islands, Guam, New Hannover, New Britain, Solomon Islands, Murray Island, Queensland, New Hebrides, Lord Howe Island, Rotuma, Samoa, Hawaii, Lisiansky Island. In sea.

3. **Canthigaster margaritatus** (Rüppell) (Fig. 83, p. 364)

Tetraodon margaritatus Rüppell, Atlas Reise N. Afrika, 1828, p. 66.
Tetrodon solandri Richardson, Voyage Sulphur, Fishes, 1844, p. 125.
Tetraodon papua Bleeker, Journ. Ind. Arch. II, 1848, p. 638.
Tetraodon margaritatus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 25. — Nat. Tijdschr. Ned. Indië III, 1852, p. 302.
Tetrodon ocellatus Peters, Monatsber. Akad. Berlin 1855, p. 462 (nec Bl.).
Psilonotus margaritatus Bleeker, Ned. Tijdschr. Dierk. I, 1863, p. 265.
Canthogaster margaritatus Bleeker, Atlas Ichth. V, 1865, p. 81.
Tetrodon margaritatus Günther, Cat. Brit. Mus. VIII, 1870, p. 300.
Tetrodon papua Günther, ibid. p. 301.
Tetrodon margaritatus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 646.
Tetrodon margaritatus Day, Fishes of India, Part IV, 1878, p. 707.
Tetrodon margaritatus Waite, Mem. Austr. Mus. III, Part 9, 1899, p. 546.
Tetrodon papua Seale, Occas. Papers B. P. Bishop Mus. I, 1901, p. 118.

Canthigaster solandri Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 371.

Tetrodon margaritatus Günther, Fische der Südsee III, 1910, p. 470.

Tropidichthys margaritatus Annandale & Jenkins, Mem. Indian Mus. III, No. 1, 1910, p. 16.

Canthigaster papua Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 501.

Tropidichthys margaritatus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 977.

Canthigaster margaritatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 466. — Occas. Papers B. P. Bishop Mus. IX, 1932, p. 16.

Canthigaster margaritatus Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 431.

Canthigaster solandri Herre, l.c.

Canthigaster margaritatus Fowler, Monogr. Acad. Nat. Sci. Philadelphia 2, 1938, p. 151, p. 178.

Canthigaster margaritatus Abe, Bull. Biogeogr. Soc. Japan 14, No. 1, 1949, p. 3, p. 5.

Canthigaster margaritatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 421.

Canthigaster margaritatus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 279.

D. 1. 8. A. 1. 8. P. 2. 15.

Head 2.4-2.5, 3.18-3.2 in length with caudal. Eye high, not interfering with upper profile of head, 4.2-4.4, 2.4-3 in the slightly concave, pointed snout and 1.2-1.4 in the somewhat concave interorbital space. Nostrils small, oblong depressions of the skin, surrounded by a low rim. Head, body, and tail covered with very small spines, the skin feeling rough when stroked from tail to head. Dorsal ridge developed from posterior part of interorbital space to somewhat elevated base of dorsal. No lateral lines. Dorsal and anal rounded, the longest dorsal rays 2-2.5, the longest anal rays 2.2-2.6 in head. Origin of anal behind dorsal. Pectorals more or less fan-like, the longest rays 1.8-2.75 in head. Caudal slightly rounded. Caudal peduncle compressed, deeper than long, the length, measured from anal 1.2 in its depth. Colour of preserved specimens brown, slightly lighter on chin and throat. Interorbital space crossed by blue stripes, bordered by narrow black lines, running from eye to eye. On upper part of snout similar stripes, parallel to those on interorbital space. A few similar stripes running from behind mouth horizontally to below gill opening. Similar stripes radiating from eye, the anterior and superior ones being the continuations of those on the interorbital space, the posterior ones ending at a short distance behind eye, but sometimes continued on back and reaching ocellus below dorsal. Cheeks, body, tail, and caudal covered with light blue ocelli, surrounded by black. A large, round, black ocellus below base of dorsal, partly surrounded by a blue stripe, bordered externally by black. This stripe begins at base of dorsal, encircles the ocellus superiorly, anteriorly and inferiorly, and then runs along superior part of caudal peduncle, leaving the posterior border of the ocellus free. Dorsal, anal, and pectorals yellowish, without spots or stripes. Length 112 mm.

Habitat: Sumatra (Atcheen!, Padang!); Duizend Islands; Sumbawa; Solor; Sulu Islands!; Ternate; Buru; Ambon!; Banda; Timor; Kei Islands!; Misol; New Guinea. — East coast of Africa as far south as East London, Mozambique, Madagascar, Zanzibar, Red Sea, Muscat, Aden, coasts of India, Ceylon, China, Philippines, Pelew Islands, Marianas, Carolines, New Britain, Ellice Islands, Rotuma, Fiji, Phoenix Islands, Samoa, Society Islands, Taomotu Islands, Thornton Island, Hawaii.

Note. Bleeker (1865) united his own species *papua* with *margaritatus* and *solandri*, but Günther (1870) separated *papua* again from *margaritatus* and *solandri*, chiefly on characteristics of the coloration and on the distribution of the spines on the skin, which are said to be absent on the tail in *papua*. Klunzinger (1871), however, says that in his material from the Red Sea all intergrades between the two supposed species are present and hence Günther (1910) united them again, but giving descriptions of the three forms *margaritatus, solandri,* and *papua*. Although, according to Günther, no geographical races can be distinguished, he says that *margaritatus* specially occurs in the western part of the Indic, and that it is not certain that this variety occurs in the Pacific. He records *solandri* from a number of islands in the Pacific, whereas *papua* occurs in the Indo-Australian Archipelago, New Britain, and Saypan. Later authors, as far as they separate the three forms, have recorded *papua* from the Philippines, Guam, Funafuti, and Rotuma. The variety *solandri* has only been recorded from islands in the Pacific, and Herre records *solandri* as well as *margaritatus* from the Society Islands. As far as our knowledge goes at present it can be said that *margaritatus* is the only variety occurring in the Indic, but not being restricted to that ocean, that *papua* is the only variety known from the Indo-Australian Archipelago, with exception, however, of the specimen recorded above from Padang, Sumatra, which belongs to the variety *margaritatus*. The variety *papua* also occurs in the W. Pacific (Funafuti and Rotuma), but *solandri* has never been found outside the Pacific.

4. **Canthigaster bennetti** (Blkr)

Tetrodon ocellatus Bennett, Fishes of Ceylon, 1828-1830, p. 21 (nec Bl.).

Tetraodon papua Bleeker, Verh. Bat. Gen. XXV, 1853. Nalez. ichth. fauna Bengalen, p. 78 (nec Blkr. 1848).
Tropidichthys Bennetti Bleeker, Nat. Tijdschr. Ned. Indië VI, 1854, p. 504.
Anosmius Bennetti Bleeker, ibid. XIII, 1857, p. 374.
Psilonotus Bennetti Bleeker, Acta Soc. Sci. Indo-Neerl. VIII, 1860. Achtste bijdr. kennis vischfauna Sumatra, p. 66.
Canthogaster ocellatus Bleeker, Atlas Ichth. V, 1865, p. 80.
Psilonotus ocellatus Bleeker, ibid. Tab. CCXIV, fig. 5.
Tetrodon bennetti Günther, Cat. Brit. Mus. VIII, 1870, p. 311. — Fische der Südsee III, 1910, p. 471.
Tropidichthys Bennetti M. Weber, Siboga Exp. Fische, 1913, p. 586.
Canthigaster bennetti Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 502.
Canthigaster bennettii Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 466.
Canthigaster bennetti Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 430.

D. 1. 9. A. 1. 8. P. 2. 12.

Head 2.56-2.7, 3.29-3.4 in length with caudal. Eye high but not interfering with upper profile of head, 3.7-4.2, 2.25-2.6 in snout and 1-1.2 in concave interorbital space. Profile of pointed snout somewhat concave. Nostrils rounded depressions with a low rim before eye. Small spines on head, body, and tail, rather crowded on head, less numerous on back and sides of body. Dorsal ridge developed from behind interorbital space to origin of dorsal. No lateral lines. Dorsal and anal somewhat pointed, the longest dorsal rays 2.3-3 in head, the longest anal rays 2.6-3.7 in head. Origin of anal behind dorsal. Pectorals truncate or the upper margin slightly concave, the superior rays longest and 2.3-2.6 in head. Caudal truncate. Caudal peduncle compressed, its least depth 1.2-1.5 in its length, measured from anal. Colour of preserved specimens dark reddish brown above, light yellowish with a slight silvery hue below. Light blue stripes, bordered by black, radiate from eye. Similar, oblique stripes behind corner of mouth. A similar median stripe from chin to anus. Sides of head, body, and tail with numerous small blue ocelli, bordered by black, less numerous on back. Base of dorsal in a black patch, surrounded by an incomplete blue stripe. Similar incomplete, parallel stripes, bordered by black, running obliquely upwards on each side of upper part of caudal peduncle. Fins uniform yellowish. Length 100 mm.

Habitat: Singapore Sumatra (Priaman, Padang); Bali; Celebes (Menado); Sulu Islands!; Sangir Islands; Saleyer!; Binongka!; Solor; Haingsisi!; Letti; Sula-Besi!; Ternate; Buru; Ceram; Gisser!; Goram; Ambon; Nusa Laut!; Banda!; New Guinea (Hood Bay, Madang). — Zanzibar, Maldives, Ceylon, Philippines, Ponapé, Murray Island, N. Queensland, Santa Cruz Islands, New Hebrides, Fiji, Samoa, Tahiti, Taomotu Islands. In sea.

5. **Canthigaster janthinopterus** (Blkr)

Tropidichthys janthinopterus Bleeker, Nat. Tijdschr. Ned. Indië VIII, 1855, p. 429.
Psilonotus janthinopterus Bleeker, Acta Soc. Sci. Indo-Neerl. VIII, 1860. Dertiende bijdr. kennis vischfauna Celebes p. 13.
Canthogaster janthinopterus Bleeker, Atlas Ichth. V, 1865, p. 82.
Tetrodon janthinopterus Günther, Cat. Brit. Mus. VIII, 1870, p. 302. — Fische der Südee III, 1910, p. 471.
Canthigaster janthinopterus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 466.

D. 1. 8. A. 1. 8. P. 14.

Head 2.33, 3 in length with caudal. Eye high, but not interfering with upper profile of head, 3.3, 1.8 in snout and 1.25 in somewhat concave interorbital space. Profile of pointed snout somewhat concave. Nostrils minute rounded depressions. Distant two-rooted spines on head, back, sides of body and belly, not on tail. Dorsal ridge beginning above gill opening. Dorsal and anal rounded, longest dorsal rays 3, longest anal rays 3.3 in head. Origin of anal behind end of dorsal. Pectorals truncate, the upper rays longest and 2.3 in head. Caudal truncate. Least depth of caudal peduncle 1.6 in its length. Colour of specimen examined yellowish and brown, a dark blotch before and below dorsal. In life a black ocellus, surrounded by bluish on base of dorsal. Sides of body and tail with numerous round whitish spots larger than the pupil and separated from one another by a network of the brown ground colour. Sides of head with scarcely any spots, but some bluish horizontal lines cross the eye. Fins uniform. Length 75 mm. (A discoloured specimen of Bleeker's collection in the Leiden Museum examined).

Habitat: Celebes (Menado); Sula Islands !; Ambon. — Comores, Philippines, Ponapé, New Hebrides.

Note. Günther (1910, l.c.) is of opinion that *janthinopterus* is a colour variety of *bennetti*.

6. **Cantigaster compressus** (Procé)

Tetrodon compressus Procé, Bull. Soc. Philom. Paris, 1822, p. 130.
Tetraodon striolatus Quoy & Gaimard, Voyage Uranie & Physicienne, Zool. 1824, p. 203.
Tropidichthys striolatus Bleeker, Nat. Tijdschr. Ned. Indië VI, 1854, p. 503.
Anosmius striolatus Bleeker, ibid. XIX, 1859, p. 438.
Psilonotus striolatus Bleeker, Acta. Soc. Sci. Indo-Neerl. VIII, 1860. Dertiende bijdr. kennis vischfauna Celebes, p. 13. — Atlas Ichth. V, 1865, Tab. CCXIII, fig. 6.

Canthogaster striolatus Bleeker, Atlas Ichth. V, 1865, p. 82.
Tetrodon striolatus Günther, Cat. Brit. Mus. VIII, 1870, p. 304.
?*Canthigaster compressus* Evermann & Seale, Proc. U.S. Nat. Mus. XXXI, 1906, p. 510.
Tetrodon striolatus Günther, Fische der Südsee III, 1910, p. 473.
Canthigaster compressus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 500.
Canthigaster striolatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 466.
Canthigaster compressus Abe, Bull. Biogeogr. Soc. Japan 14, No. 1, 1949, p. 4, p. 7.

D. 1. 8. A. 1. 8. P. 2. 15.

Head 2.5-2.7, 3.3-3.4 in length with caudal. Eye high, not interfering with upper profile of head, 4.4-4.8, 2.6-3.2 in the long, pointed and almost straight snout, and 1.25-1.6 in the concave interorbital space. Nostrils small, oblong, depressions surrounded by a low rim. Short, blunt spines on snout, interorbital space, cheeks, and back to before dorsal, less distinct on sides and belly. Dorsal ridge developed from posterior part of interorbital space to somewhat elevated base of dorsal. No lateral lines. Dorsal truncate, the longest, anterior rays 2.25-3.2 in head. Anal rounded, the longest rays 2.2-2.7 in head. Pectorals truncate, the longest rays 2.3-3 in head. Caudal rounded. Caudal peduncle compressed, as deep as long, the length, measured from anal equal to half length of head or slightly shorter. Colour of preserved specimens dark brown, lighter below. Upper part of head with more or less horizontal light blue stripes, bordered by black lines, more or less radiating from eye. A black ocellus below dorsal, surrounded by a light blue line and often with a light blue stripe in its centre. Back, sides, and tail with light blue vermiculating lines, sometimes broken into rows of small, blue spots. Caudal with many narrow vertical brown stripes. Other fins uniform, whitish. Length 89 mm.

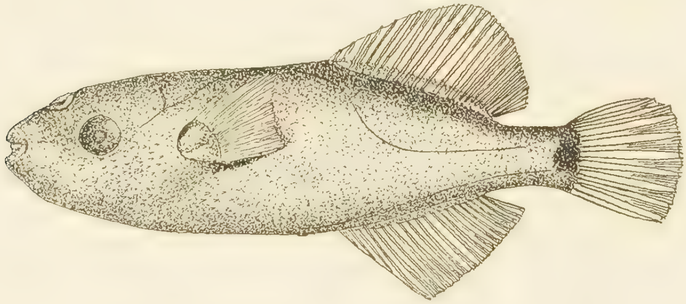

Fig. 84. *Chonerhinus modestus* (Blkr.). nat. size.

Habitat: Sulu Islands; Sangir Islands; Celebes (Badjoa, Menado); Saleyer!; Solor; Timor; Ternate; Halmahera; Buru; Ambon. — Philippines, Solomon Islands, New Hebrides, Fiji, Hawaii.

2. **Chonerhinus** Bleeker

(Chonerhinos Bleeker, Nat. Tijdschr. Ned Indië VII, 1854, p. 259)
Xenopterus Bibron, Rev. Mag. Zool. VIII, 1855, p. 281.

Oblong, moderately compressed. Back rounded, without ridge. Nasal sac large, before and somewhat above eye, consisting of a deep depression of the skin, surrounded by an elevated rim, partly produced into two lobes. Upper and lower lateral lines well developed. Long spines only developed on belly and posterior part of sides of head, present or absent on sides of body; tail and anterior part of head always naked. Dorsal and anal long. Dorsal with 25-38 rays, anal with 23-33 rays. Origin of anal somewhat behind that of dorsal. Caudal rounded.

Distribution: Three freshwater species are known from Burma, Siam, Malay Peninsula, Indochina, China, Sumatra and Borneo.

Key to the Indo-Australian species of Chonerhinus

a. Dorsal with 35-36 rays. Anal with 28-29 rays (*Xenopterus*) . . . . 1. *C. naritus* p. 373.
b. Dorsal with 25-26 rays. Anal wit 23 rays (*Chonerhinus* s. str.) . . . . 2. *C. modestus* p. 374

1. **Chonerhinus naritus** (Rich.)

Tetraodon naritus Richardson. Zool. Voyage Samarang, Fishes, 1848, p. 18.
Tetraodon naritus Cantor, Journ. Asiat. Soc. Bengal XVIII, Part II, 1850, p. 1365.
Tetraodon naritus Bleeker, Verh. Bat. Gen. XXIV. 1852. Bijdr. kennis blootk. visschen, p. 21. — Nat. Tijdschr. Ned. Indië III, 1852, p. 439.
Tetrodon grandispina Van der Hoeven, Handb. Dierk. 2. ed. I, 1855, p. 275 (nomen nudum).
Chonerhinus naritus Bleeker, Atlas Ichth. V, 1865, p. 77.
Xenopterus naritus Günther, Cat. Brit. Mus. VIII, 1870, p. 271.
Xenopterus naritus Day, Fishes of India, Part IV, 1878, p. 699.
Xenopterus naritus Vinciguerra, Ann. Mus. Civ. Genova (2) IX, 1890, p. 573, p. 574.

D. 4. 31-32. or 5. 31. A. 3. 25-26 or 2. 26. P. 2. 15-16.

Head 3.16, 3.7 in length with caudal. Eye scarcely above level of mouth, 9.5, 4.5 in snout and 5 in convex interorbital space. Nasal sac a rounded depression of the skin, before and somewhat above eye, larger than eye, surrounded by a high rim. This rim has vertical, parallel lamellae at its inner side posteriorly; anteriorly the rim is very low for a short distance, forming a kind of groove which gives access to the sac; this groove flanked by an elevated lobe of the rim on each side. Greater part of head, tail, and greater part of back naked; throat, belly, posterior sides of head, sides of body and region above pectorals with very strong spines, each spine with a long, straight root, these roots arranged on belly and sides of body in parallel longitudinal rows. Sensory canals forming sinuous and anastomizing grooves on head. Upper lateral line forming the upper border of the spinous area on sides of body, bent downwards below dorsal, then running along middle of caudal peduncle, sharply turned in opposite direction at base of caudal and running backwards along base of dorsal. The lower lateral line runs along base of anal and ends at base of caudal below upper lateral line. Dorsal and anal arched or more or less triangular, the median rays longest and 2.1 in head. Pectorals rounded, the upper rays longest and 2.2 in head. Caudal rounded. Colour of preserved specimens brownish above, lighter below. Length 285 mm.

Habitat: Sumatra (Banju Asin, Bagan Si Api Api, Palembang); Borneo (Sarawak, Sambas, Pamangkat, Sinkawang, River Kapuas, Banjermasin, Labang hara, soengei Serawai!). — Burma, Siam, Malay Peninsula, Indochina, China. In rivers.

Note. Van der Hoeven's *T. grandispina* is a nomen nudum. In his book he gives an example of a *Tetraodon* with a nasal sac consisting of a "large wide hollow with plicated borders, as in *Tetrodon grandispina,* a new species from Borneo in the Leiden Museum (*Chelonodon* Müller.)" (Translation from the Dutch). Bleeker examined this specimen and ascertained that it belongs to *naritus.*

2. **Chonerhinus modestus** (Blkr) (Fig. 84, p. 372)

Tetraodon (*Arothron*) modestus Bleeker, Nat. Tijdschr. Ned. Indië I, 1850, p. 16.
Tetraodon modestus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 19. — Nat. Tijdschr. Ned. Indië III, 1852, p. 440.
Chonerhinos modestus Bleeker, Nat. Tijdschr. Ned. Indië VII, 1854, p. 260.
Chonerhinus modestus Bleeker, Atlas Ichth. V, 1865, p. 78.
Xenopterus modestus Günther, Cat. Brit. Mus. VIII, 1870, p. 271.
Xenopterus modestus Vinciguerra, Ann. Mus. Civ. Genova (3) X, 1926, p. 536.
Chonerhinus modestus Hugh Smith, U.S. Nat. Mus. Bull. 188, 1945, p. 573, p. 574.

D. 5. 20-21. A. 3. 20. P. 2. 12-14.

Head 3-3.07, 3.5-3.67 in length with caudal. Eye scarcely above level of mouth, 4.4-5.58, 2-2.3 in snout and 2.2-3.16 in convex interorbital space. Nasal sac open, funnel-like, situated before and somewhat above eye. A patch of rather large spines on cheeks, below pectorals and on anterior part of belly; rest of head and body, and tail naked. Dorsal somewhat rounded, the longest rays 2.2-2.3 in head. Pectorals fan-like, the longest rays 2.3-2.7 in head. Caudal rounded or truncate. Colour of preserved specimens dark above, light below. Length 130 mm. (A specimen of Bleeker's collection in the Amsterdam Museum examined).

Habitat: Sumatra (Banjuasin and affluents, Palembang); Borneo (Segalind and Sibujal Rivers, Sarawak, Sambas, Pontianak, middle and upper course of Kapuas River, Sintang, Banjermasin, middle course of Mahakam River. — Malay Peninsula, Siam. In rivers.

3. **Sphoeroides** Lacepède-Anonym

(Anonym, Allgem. Literar. Zeitung Berlin, No. 287, 1798, p. 675 (on Lacepède "Les Spheroides")

Spheroides Duméril, Zool. Anal. 1806, p. 342 (on Lacepède).
Lagocephalus Swainson, The Natural History of Fishes II, 1839, p. 328.
Amblyrhynchotes Troschel, Arch. Naturgesch. (2) XXII, 1856, p. 88.
Tetraodon Bleeker, Atlas Ichth. V, 1865, p. 59 (nec Linné).
Torquigener Whitley, Mem. Queensl. Mus. X, Part 1, 1930, p. 31.

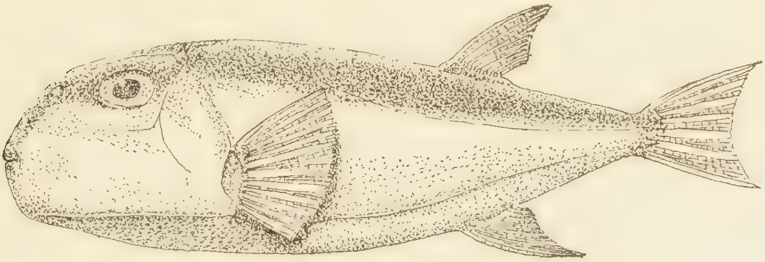

Fig. 85. *Sphoeroides spadiceus* (Rich.) × $^{5}/_{6}$.

Nasal organ on each side a hollow papilla, perforated by two smaller or larger nostrils. Back not keeled, rounded. Dorsal and anal short. Upper lateral line generally conspicuous, lower lateral line may be absent. A fold of the skin on inferior part of tail present or absent.

Key to the Indo-Australian species of Sphoeroides

A. Rather elongate. Nasal papilla low, scarcely raised above surface of snout. Two lateral lines, the lower is a raised ridge. Caudal lunate (*Lagocephalus*).
  a. Caudal peduncle depressed, wider than deep behind dorsal . . . . 1. *S. sceleratus* p. 376.
  b. Caudal peduncle compressed.
    a^1. Spines on back reaching to base of dorsal . . . . 2. *S. lunaris* p. 378.
    b^1. Spines on back reaching to above pectorals . . . . 3. *S. spadiceus* p. 379.
B. Less elongate. Nasal papilla raised above surface of snout. Caudal truncate or rounded.
  a. A raised skin fold along tail (*Torquigener*).
    a^1. Back with dark transverse bands.
      a^2. A. 3.8. Back with many bands. Nostrils on sides of papilla . . . 4. *S. oblongus* p. 381.
      b^2. A. 2. 6. Back with 1-3 bands. Nostrils on anterior and posterior surface of papilla . . . . 5. *S. pleurostictus* p. 382.
      c^2. A. 8-10. Back with 4 bands, descending to a dark longitudinal band on sides. . . . . 6. *pleurogramma* p. 383.
    b^1. Back and sides with white spots. A. 2. 8. . . . . 7. *S. alboplumbeus* p. 384.
    c^1. Back uniform or with dark spots. A. 2. 7-8. Nostrils on anterior and posterior surface of papilla. . . . . 8. *S. meraukensis* p. 385.
  b. No raised skin fold along tail (*Amblyrhynchotes*).
    a^1. Chin prominent. Inferior border of eye only free.
      a^2. D. 2. 8-9. Cheeks without vertical dark bands . . . . 9. *S. honckeni* p. 386.
      b^2. D. 2. 6-7. Cheeks with vertical dark bands.
        a^3. Length of base of dorsal about 3 times in its height . . . . . 10. *S. florealis* p. 387.
        b^3. Length of base of dorsal about twice in its height . . . . . 11. *S. hypselogeneion* p. 388.
    b^1. Chin not prominent. D. 2. 7-3.7. Eyes with a free border all round . . . . 12. *S. richei* p. 389.

1. **Sphoeroides sceleratus** (Forster) Gm. L.

Tetraodon sceleratus (Forster) Gmelin, Linné. Syst. Nat. 1788, p. 1444.
Tetrodon sceleratus Bloch Schneider, Syst. Ichth. 1801, p. 506.
Tetrodon argenteus Lacepède, Ann. Mus. Hist. Nat. IV, 1804, p. 211.

Tetrodon argyropleura Bennett, Comm. Zool. Soc. London II, 1832, p. 184.
Tetrodon sceleratus (Forster) Lichtenstein, Descr. Anim. 1844, p. 282.
Tetrodon argenteus Schlegel, Fauna Japonica, Pisces 6, 1850, p. 275.
Tetraodon argenteus Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 737.
Gastrophysus argenteus Bleeker, Verh. Akad. Amsterdam II, 1855. Over eenige visschen van van Diemensland, p. 16.
Tetraodon argenteus Bleeker, Atlas Ichth. V, 1865, p. 64.
Tetrodon sceleratus Günther, Cat. Brit. Mus. VIII, 1870, p. 276.
Tetrodon sceleratus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 640.
Tetraodon sceleratus Bleeker, Ned. Tijdschr. Dierk. IV (1871) 1872, p. 121.
Tetrodon sceleratus Day, Fishes of India, Part IV, 1878, p. 701.
Tetrodon sceleratus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 273.
Spheroides sceleratus Jordan & Snyder, Proc. U.S. Nat. Mus. XXIV, 1901, p. 234.
Spheroides sceleratus Jordan & Evermann, ibid. 1902, p. 359.
Tetrodon sceleratus Günther, Fische der Südsee III, 1910, p. 461.
Spheroides sceleratus McCulloch, Austral. Zool. II, Part III, 1922, p. 129.
Spheroides sceleratus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 482.
Tetrodon sceleratus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 969.
Sphoeroides sceleratus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 467.
Spheroides sceleratus P. J. Schmidt, Trans. Pac. Comm. Acad. Sci. U.S.S.R. 1, 1930, p. 109.
Pleuranacanthus sceleratus Whitley, Rec. Austr. Mus. XIX, 1933, p. 106.
Lagocephalus sceleratus Blegvad, Danish Inv. Iran. Part III, 1944, p. 218.
Sphoeroides sceleratus Boeseman, Zoöl. Med. XXVIII, 1947, p. 197.
Lagocephalus sceleratus Yun-Shang Liang, Quart. Journ. Taiwan Mus. 1, No. 2, 1948, p. 18.
Gastrophysus sceleratus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 418.
Gastrophysus sceleratus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 280.

D. 1. 9. A. 1. 8. P. 1. 14.

Head 3.4, 4 in length with caudal. Eye 3.3, 1.3 in snout. Interorbital space flat, 1.2 in eye. Lower border of eye slightly above level of mouth. Eye with a free orbital rim, except its superior part. A pair of nostrils before eyes, each consisting of a papilla, pierced by two openings. Sensory canals on head surrounding eyes, the upper and the lower branches converging anteriorly and forming a rounded curve behind corner of mouth. The lower branch with a gentle curve downwards below eye and ascending behind eye, running along sides of back as the upper lateral line, gently sloping down before dorsal and continued on middle of sides of caudal peduncle to base of caudal. Lower lateral line running from chin in a straight line to lower part of base of caudal, forming a very low ridge in its posterior part. Upper side of head and back to origin of dorsal covered with crowded spines; chin, throat and belly to anus covered with less crowded spines; rest of head, body, and tail, naked. Dorsal and anal pointed, somewhat falcate, the longest rays 3 in head. Pectorals slightly pointed, the superior, longest, rays 1.85 in head. Caudal forked. Caudal peduncle depressed, its least depth 5.7 in its length, measured from anal, and 2.6 in its breadth immediately behind dorsal. Colour of preserved specimens brown with darker spots above. A ring round eye also brown. Sides with a broad silvery band from chin to middle of caudal peduncle. A triangular silvery patch before eye. Lower side whitish. Length 750 mm.

Habitat: Singapore; Banka; Biliton; Java (Jakarta, Toasia, Anjer); Bali; Borneo (Sambas); Celebes (Makassar, Amurang, Menado); Ambon!; Aru Islands; New Guinea (Hood Bay, Hall Sound). — East coast of Africa as far south as the Cape, Zanzibar, Mauritius, Réunion, Seychelles, Cape Guardafui, Red Sea, South Arabia, Gulf of Iran, coasts of India, Ceylon, Siam, Cochinchina, China, Pescadores Islands, Formosa, Riu Kiu Islands, Japan, Philippines, Bonin Island, Engineer Group, Australia, New Caledonia, Lord Howe Island, Fiji, Tahiti.

Note. This species is known to be very poisonous (see Seale, Philipp. Journ. Sci. VIII, 1912, pp. 289-291).

2. **Sphoeroides lunaris** (Bl. Schn.)

Tetrodon lunaris Bloch Schneider, Syst. Ichth. 1801, p. 505.

Tetrodon lunaris Cantor, Journ. Asiat. Soc. Bengal XVIII, Part II, 1850, p. 1360.

Tetraodon lunaris Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 12 (pro parte).

Gastrophysus lunaris Bleeker, Nat. Tijdschr. Ned. Indië XII, 1856-1857, p. 235.

Tetraodon lunaris Bleeker, Atlas Ichth. V, 1865, p. 63.

Tetraodon lunaris Kner, Novara Exp. Fische, 1865-1867, p. 407.

Tetrodon lunaris Günther, Cat. Brit. Mus. VIII, 1870, p. 274.

Tetrodon lunaris Day, Fishes of India, Part IV, 1878, p. 701 (pro parte).

Tetrodon lunaris de Castelnau, Proc. Linn. Soc. New S. Wales III, 1879, p. 400.

Tetrodon (*Lagocephalus*) *lunaris* Steindachner, Denkschr. Akad. Wien LXXI, 1902, p. 159.

Spheroides lunaris Jordan & Seale, Proc. Dav. Acad. Sci. X (1905) 1907, p. 14.

Spheroides lunaris Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 482 (pro parte).

Sphoeroides lunaris Fowler, Proc. Acad. Nat. Sci. Philadelphia 86, 1934, p. 510.

Lagocephalus lunaris Fowler, Proc. New England Zool. Club XV, 1935, p. 56.

Spheroides lunaris Blegvad, Danish. Inv. Iran. Part III, 1944, p. 217.

Lagocephalus lunaris Abe, Bull. Biogeogr. Soc. Japan 14, No. 1, 1949, p. 13.

Gastrophysus lunaris J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 418.

Gastrophysus lunaris Munro, The marine and fresh water of Ceylon, 1955, p. 280.

D. 1. 11-12. A. 1. 9-10. P. 1. 15.

Head 2.8-2.9, 3.5-3.6 in length with caudal. Eye high, above level of mouth, but not interfering with upper profile of head, 3.4, 1.7-1.8 in snout and 1.15-1.5 in the flat interorbital space. Eye with a free rim ,except its posterior part. A pair of nostrils before each eye, each consisting of a short papilla pierced by two large openings. Sensory canals on head beginning near nostril, one branch running downwards and forwards, then bent backwards and running in horizontal direction below eye, abruptly bent upwards below posterior part of eye, meeting behind eye another branch which runs above eye on interorbital space and continued as upper lateral line along sides of back, curved downwards before origin of dorsal and running along middle of caudal peduncle to base of caudal. Lower lateral line forming a low, straight ridge from chin to lower part of caudal. Short crowded spines cover interorbital space and back to origin of dorsal. Underside of head behind vertical through front border of eye and belly to some distance before anus also spiny; rest of head, body and tail naked. Dorsal and anal pointed, the anterior longest rays 1.7-1.8 in head. Origin of anal slightly behind that of dorsal. Pectorals long, their hindborder somewhat concave, the upper rays much longer than the lower rays and 1.8-1.9 in head. Caudal forked, the lobes pointed. Least depth of caudal peduncle 2.77-3.17 in its length, measured from anal. Caudal peduncle compressed. Colour of preserved specimens brownish above, lighter below, sides of body and tail more or less silvery. Length 300 mm.

Nomen indig. Buntel pisang.

Habitat: Singapore; Sumatra (Atcheen!, Padang, Priaman, Bagan Si Api Api, Benkulen); Nias; Batu Islands; Banka; Java (Jakarta!, Bantam, Anjer, Tiku, Japara); Borneo (Sarawak, Sandakan, Tawau, Sambas, Pamangkat, Sinkawang, Sungiduri, Kapuas River, Kumai River); Celebes (Makassar!, Badjoa, Menado); Flores!; Ambon; New Guinea (Rubi). — Coast of eastern Africa as far south as Knysna, Mozambique, Zanzibar, Sokotra, Red Sea, Suez Canal, Persian Gulf, coasts of India, Ceylon, Andamans, Siam, Pulu Tikus, Malay Peninsula, Tonkin, Formosa, China, Japan, Philippines, Queensland, New South Wales, Solomon Islands, Fiji. In sea and rivers.

3. **Sphoeroides spadiceus** (Rich.) (Fig. 85, p. 375)

Tetrodon spadiceus Richardson, Fishes of the Voyage Sulphur, 1844, p. 123.
Tetraodon lunaris Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 12 (pro parte).
Tetradon spadiceus Bleeker, Atlas Ichth. V, 1865, p. 64.

Tetrodon lunaris, var. *spadiceus* Günther, Cat. Brit. Mus. VIII, 1870, p. 275.
Tetrodon lunaris Day, Fishes of India, Part IV, 1878, p. 701 (pro parte).
Spheroides spadiceus Jordan & Snyder, Proc. U.S. Nat. Mus. 24, 1901, p. 234.
Spheroides spadiceus Fowler & Bean, ibid. 62, 1922, Art. 2, p. 60.
Lagocephalus spadiceus Jordan & Hubbs, Mem. Carnegie Mus. X, 1922-1925, p. 257.
Spheroides spadiceus McCulloch, Austr. Zool. II, Part III, 1922, p. 129.
Tetrodon spadiceus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 968.
Spheroides spadiceus Machan, Ann. Naturh. Mus. Wien XLIV, 1930, p. 440.
Sphoeroides spadiceus Boeseman, Zoöl. Med. XXVIII, 1947, p. 198.
Gastrophysus spadiceus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 418.

D. I. 10-14. A. 1-9. 11. P. 1. 15. 1.

Head 2.75-3.2, 3.4-3.9 in length with caudal. Eye high, above level of mouth, but not interfering with upper profile of head, 2.9-3, 1.2-1.3 in snout and equal to or 1.2 in the flat interorbital space. Eye with a poorly developed orbital rim, not developed superiorly. A pair of nostrils above eye, each consisting of a short papilla, pierced by two large openings. Sensory canals on head beginning below nostrils, one branch running downwards and forwards, then curved backwards and running in horizontal direction below eye, gently curved upwards below posterior part of eye, meeting behind eye another branch which runs above eye on interorbital space and continued as upper lateral line along sides of back, curved downwards before origin of dorsal and running along middle of caudal peduncle to base of caudal fin. Lower lateral line forming a low, straight rim from chin to lower part of base of caudal. Short crowded spines cover interorbital space and reach backwards in a pointed area to above middle of pectorals. Underside of head behind vertical through front border of eye, and belly to some distance before anus, also spiny; the rest of head, body, and tail naked. Dorsal and anal pointed, slightly falcate, the longest dorsal rays 1.6-1.7, the longest anal rays 1.7-1.8 in head. Pectorals slightly pointed, the longest rays 1.7-1.8 in head. Caudal forked, the lobes pointed. Least depth of caudal peduncle 4.1 in its length, measured from anal. Caudal peduncle compressed. Colour of preserved specimens brown above, sides silvery, belly white. Length 300 mm.

Habitat: Sumatra (Padang, Benkulen); Banka; Java (Jakarta); Borneo; Celebes (Makassar!; Badjoa); Lombok!; Sumba!; Ambon. — Eastern coast of Africa as far south as Knysna, Red Sea, coasts of India, Indochina, China, Formosa, Korea, Japan, Philippines, Port Darwin, New South Wales.

Note. This species chiefly differs from *lunaris* by the spiny part of the back which does not reach to the dorsal, but many authors, having found all stages of intergrading forms, unite the two. It is certain that the two species are not males and females of a single one, as Kner who examined typical *lunaris* (l.c.), found both sexes among his material. Provisionally I keep the two species apart. The distribution of *spadiceus,* as given about, is probably imcomplete, as authors who record *lunaris* without giving a description may have considered *spadiceus* a synonym of *lunaris.*

4. **Sphoeroides oblongus** (Bl.)

Tetrodon oblongus Bloch, Ausländ. Fische II, 1786, p. 6.
Tetrodon oblongus Bloch Schneider, Syst. Ichth. 1801, p. 504.
Physogaster oblongus J. Müller, Abh. Akad. Wiss. Berlin 1839, p. 252.
Tetrodon oblongus Cantor, Journ. Asiat. Soc. Bengal XVIII, Part 2, 1850, p. 1362.
Tetraodon oblongus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 12.
Gastrophysus oblongus Bleeker, Nat. Tijdschr. Ned. Indië XVIII, 1859, p. 374.
Tetraodon oblongus Bleeker, Atlas Ichth. V, 1865, p. 62.
Tetraodon oblongus Kner, Novara Exp. Fische, 1865-1867, p. 406.
Tetrodon oblongus Günther, Cat. Brit. Mus. VIII, 1870, p. 278 (pro parte).
Tetrodon oblongus Day, Fishes of India, Part IV, 1878, p. 702 (sine syn.).
Tetrodon oblongus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 274 (pro parte).
Spheroides oblongus McCulloch, Austr. Zoologist II, Part III, 1922, p. 129.
Spheroides oblongus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 484.
Sphoeroides oblongus Hora, Mem. Asiat. Soc. Bengal VI, 1924, p. 498.
Tetrodon oblongus Vinciguerra, Ann. Mus. Civ. Genova (3) X, 1926, p. 537.
Tetrodon oblongus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 967.
Sphoeroides oblongus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 467. — Journ. Bombay Nat. Hist. Soc. XXXIII, No. 1, 1929, p. 119.
Spheroides oblongus Wu, Sinensia I, No. 11, 1931, p. 168.
Sphoeroides oblongus Hora & Mukerji, Rec. Ind. Mus. XXXVIII, Part 1, 1936, p. 39.
Lagocephalus oblongus Fowler, Proc. Acad. Nat. Sci. Philadelphia LXXXIX, 1937, p. 264, figs. 294 and 295.
Pleuracanthus oblongus Whitley, W. Austral. Fish. Bull. No. 2, 1948, p. 32.
Sphoeroides (*Takifugu*) *oblongus* Abe, Bull. Biogeogr. Soc. Japan 14, No. 13, 1949, p. 90, p. 94.
Torquigener oblongus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 418.
Takifugu oblongus Whitley, Rec. Austr. Mus. XXIII, No. 3, 1953, p. 130.
Torquigener oblongus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 280.

D. 3. 9-3. 10. A. 3. 8. P .1. 15.

Head 2.7-2.8 3.45-3.5 in length with caudal. Eye high, not interfering with upper profile of head, 4.4-4.6; 1.7-2.25 in snout and 1.4-3 in slightly convex or flat interorbital space which is comparatively wider in large specimens. Eye with a free orbital rim except above. A pair of nasal organs before eye, each consisting of a slightly raised papilla, perforated by two openings looking sidewards, the outward one more or less tube-like and lamellated interiorly. Upper lateral line running along back anteriorly, gently sloping down to caudal peduncle posteriorly. Lower lateral line a slightly undulating line from chin to lower part of base of caudal, not always distinct, a rather indistinct ridge above it in its posterior part, beginning about below origin of dorsal. Head and body covered with rather long spines, those of the back distinctly two-rooted. Snout, surrounding of mouth, surroundings of gill opening and entire tail, naked. Dorsal and anal somewhat pointed, the median rays longest and 1.8-2 in head. Origin of anal below anterior half of dorsal. Upper pectoral rays slightly longer than lower ones and 2.3-2.4 in head. Caudal slightly rounded. Least depth of caudal peduncle 1.59-1.7 in its length, measured from anal. Caudal peduncle compressed. Colour of preserved specimens light brown above, white below. Upper part of head dark brown with light spots, back with broad dark brown transverse bands or saddles, forming loops on sides. Sometimes the bands on back are much broader than interspaces and the colour can be described as black above, creamy below. Head with creamy spots above, back with creamy saddles, often interrupted in rows of light blotches. Length 265 mm.

Habitat: Singapore!; Sumatra (Lower Langkat, Bagan Si Api Api, Padang!, Benkulen); Bintang; Banka; Java (Jakarta!, Palabuan Ratu); Borneo (Sarawak, Sandakan, Tawau, Samarinda!, River Kapuas, Sampit, Banjermasin); Flores!; Ambon; New Guinea (Hall Sound). — Delagoa Bay, Mozambique, Réunion, Red Sea, coasts of India, Ceylon, Burma, Siam, Malay, Peninsula, Tonkin, China, Japan, Philippines, Woodlark Island, West Australia, New South Wales, New Hebrides, Lord Howe Island, Kermadec Island, Samoa. In sea and rivers.

5. **Sphoeroides pleurostictus** (Gthr)

Tetrodon pleurostictus Günther, Proc. Zool. Soc. London 1871, p. 674.
Tetrodon fasciatus Macleay, Proc. Linn. Soc. New S. Wales II, 1878, p. 365 (nec McClelland).
Tetrodon pleurostictus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 276.
Tetrodon pleurostictus Tate Regan, Proc. Zool. Soc. London 1902, II, p. 302.
Tetrodon fasciatus M. Weber, Nova Guinea V, Livr. 2, 1908, p. 264 (nec McClelland).
Tetrodon pleurostictus Günther, Fische der Südsee III, 1910, p. 463.
Spheroides pleurostictus McCulloch, Austr. Zoologist II, Part III, 1922, p. 129.

Sphoeroides pleurostictus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 468.
Tetrodon fasciatus Fowler, ibid. p. 471 (nec McClelland).

D. 2. 9-10. A. 2. 6. P. 2. 16.

Head 2.1-2.5, 2.65-3.4 in length with caudal. Eye high but not interfering with upper profile of head, entirely above level of mouth, without free orbital rim, 3.3-6.3, 1-1.16 in snout and 1.66-2.3 in slightly convex interorbital space. Nasal organs before superior half of eye, consisting of an elevated hollow papilla pierced by two very large openings. Lateral lines inconspicuous. A raised fold of the skin along inferior part of tail. Upperside of head, from above middle of eyes to gill opening with two-rooted spines. Throat, breast, and belly, from below hindborder of eye to a short distance before anus also spiny, rest of fish naked. Lips papillated. Dorsal and anal somewhat rounded, the longest rays 2.6 in head. Origin of anal below anterior half of dorsal. Pectorals almost truncate, the longest rays 3.16 in head. Caudal truncate Least depth of caudal peduncle 1.6-1.7 in its length, measured from anal. Colour of preserved specimens light brownish above, white below. A broad, brown transverse band over back, ending on sides behind base of pectorals. A second band below dorsal, ending before middle of side; a third band as a saddle on caudal peduncle, the second and third bands not always distinct. A faint band on interorbital space, connecting the upper borders of the eyes. Fins uniform, yellowish. Length 150 mm.

Habitat: New Guinea (mouth of Merauke River!). — Australia.

Note. Regan (l.c.) united *T. fasciatus* Macleay with *pleurostictus* on account of the coloration being the same. According to the descriptions of the authors, however, there is rather an important difference between the two. *T. pleurostictus* is said to have spines only on front of abdomen and on middle of back, whereas in *fasciatus* the spines are distributed as described above, after the specimens from Merauke recorded by M. Weber (l.c.). If *T. fasciatus* Macleay turns out to be a valid species, it has to be renamed, as it is preoccupied by *Tetrodon fasciatus* McClelland.

6. **Sphoeroides pleurogramma** (Regan)

Tetraodon hypselogencion Steindachner, Sitzber. Akad. Wien LIII. 1. Abth. 1866, p. 478 (nec Bleeker).
Tetrodon hypselogenion Günther, Cat. Brit. Mus. VIII, 1870, p. 277 (pro parte).
Tetrodon hypselogenion Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 273 (nec Bleeker).

Tetrodon pleurogramma Tate Regan, Proc. Zool. Soc. London 1902, II, p. 300.
Spheroides pleurogramma McCulloch, Rec. W. Austr. Mus. I, 1913, p. 227.
Spheroides pleurogramma Waite, Rec. S. Austr. Mus. II, No. 4, 1924, p. 486.
Spheroides pleurogramma Munro, Mem. Queensl. Mus. XII, Part III, 1945, p. 151.
Torquigener pleurogramma Munro, Papua and New Guinea Agric. Journ. 10. No. 4, 1958, p. 294.

D. 9-11. A. 8-10. P. 12.

Head 3-3.2. Eye 4.4-5.5. Interorbital space concave, twice diameter of eye. Nasal papilla moderately elevated, with 2 nostrils .Snout as long as wide, about 2.25 in length of head. Spines rather strong, thick-set, extending from the nostrils to the hindmargin of the pectorals on the back and sides, and from below the eye nearly or quite to the vent below. Origin of dorsal slightly in advance of that of anal. Dorsal and anal pointed, subequal in height, their longest rays about 1.6 in length of head. Pectoral fin half the length of the head. Caudal truncate. A moderately developed lateral fold on the posterior part of the body. Coulour greyish-green above, with dark brown reticulations, four broad dark bars across the back, one behind the eye, one in the space covered by the pectoral, a third at base of the dorsal, and the last on the caudal peduncle. These bars descend to a horizontal dark stripe, which passes along the middle of each side and separates the colouring of the back from the immaculate lower surfaces. Numerous black bars descend across the cheeks, but thin out below; the two broadest lie, one below the eye, the other between it and the gill opening. Length 185 mm (Compiled, not seen by me).

Habitat: New Guinea (Daugo Island). — Australia, Lord Howe Island.

7. **Sphoeroides alboplumbeus** (Rich.)

Tetrodon albo-plumbeus Richardson, Fishes, Voyage Sulphur, 1844, p. 121.
Tetrodon poecilonotus Schlegel, Fauna Japonica, Pisces 6, 1850, p. 279.
Tetraodon patoca? Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 11 (nec H.B.).
Tetraodon albo-plumbeus Bleeker, ibid. XXV. 1853. Nalez. Ichth. Fauna Bengalen, p. 161.
Gastrophysus alboplumbeus Bleeker, Nat. Tijdschr. Ned. Indië VII, 1854, p. 104.
Tetraodon alboplumbeus Bleeker, Atlas Ichth. V, 1865, p. 62.
Tetrodon oblongus, var. *alboplumbeus* Günther, Cat. Brit. Mus. VIII, 1870, p. 278.
Tetrodon alboplumbeus Steindachner, Ann. Hofmuseum Wien XI, 1896, p. 224.
Spheroides alboplumbeus J. F. Schmidt, Trans. Pacific. Comm. Acad. Sci. U.S.S.R. II, 1931, p. p. 90.
Sphoeroides alboplumbeus Boeseman, Zool. Med. XXVIII, 1947, p. 200.

Fugu (Shosaifugu) poecilonotus Abe, Jap. Journ. Ichthyol. 2, No. 2, 1952, p. 94.

D. 1. 11. A. 2. 8. P. 15.

Head 2.76, 3.47 in length with caudal. Eye high, almost interfering with upper profile of head, 6, 2.57 in snout and 3.1 in flat interorbital space. Eye superiorly without free orbital rim. Nasal organs before eye,each a slightly raised papilla, perforated by two openings. Upper lateral line running along back, gently curved downwards posteriorly on middle of caudal peduncle. Lower lateral line running from chin to caudal. A distinct ridge, beginning midway between pectorals and dorsal, on sides of body and tail, the lower lateral line running along this ridge on caudal peduncle. Skin of back and belly with prickles, extending on interorbital space and sides of head. Tail from some distance before dorsal and anal naked. Dorsal and anal somewhat pointed, the longest rays 1.7 in head. Origin of anal somewhat behind that of dorsal. Pectorals rounded, the longest rays 2.1 in head. Caudal slightly rounded. Least depth of caudal peduncle 1.8 in its length, measured from anal. Caudal peduncle compressed Colour of preserved specimens dark bluish, grey above, lighter below. A faint, dark, broad band connecting axils of pectorals over back. Posterior part of back and sides with whitish round blotches, smaller than eye. Fins greyish, caudal somewhat darker. Length 160 mm.

Habitat: Sumatra (Padang); Java (Batu Ulu!); Borneo. — Japan, China, Korea, Riu Kiu Islands, Formosa, Philippines, Ceylon?, Mozambique?, Red Sea?.

8. **Sphoeroides meraukensis** de Bfrt

Tetrodon Staigeri M. Weber, Nova Guinea V, Livr. 2, 1908, p. 264 (nec Casteln.).

Sphoeroides meraukensis de Beaufort, Beaufortia 5, 1955, p. 53.

D. 2.8-2.9. A. 2.7-2.8. P. 1. 17. 1.

Head 2.6-2.9, 3.2-3.5 in length with caudal. Eye 5-8.5, its lower border in level of corner of mouth, 2.9-5.2 in somewhat convex interorbital space and 1.8-3.1 in snout. No free orbital rim. Nasal organs above and slightly in front of eyes, forming a well developed hollow papilla, pierced anteriorly by a round opening and posteriorly by a large one which has a rim or short tube, the lower interior half of which is longitudinally lamellated. Head, except snout, anterior half of cheeks and chin covered with well developed prickles; these prickles extending on belly to anus and on back and sides to slightly behind extremity of pectorals; in young ones the prickles are hidden below the skin which is smooth on touch. Lips rather thick and strongly papillated. Upper lateral line encircling eye, those of both sides connected by a transverse line before nostrils. It runs along sides of back and is bent downwards below dorsal fin to the middle of the caudal peduncle, where it joins the lower lateral line. The lower lateral line can be traced from the corner of the mouth to below the pectoral base, where it is interrupted; it is continued at a variable distance from the end of its anterior part, runs along anal base and then is bent upwards to middle of caudal peduncle, joins the upper lateral line and ends at base of caudal fin. A feeble fold along sides of tail, more distinct in youg than in older specimens. Dorsal and anal truncate or slightly rounded, longest dorsal rays 2.08-2.4 in head, longest anal rays 2.1-2.5 in head. Origin of anal below middle or below posterior half of dorsal. Pectorals slightly rounded, the longest rays 2.1-2.5 in head. Caudal slightly rounded, truncate in small specimens. Least depth of caudal peduncle 1.67-2 in its length, measured from anal. Colour of preserved specimens lighter or darker greyish above, white or pinkish below. In young specimens upper part of head, back, and upper part of sides with smaller or larger black spots, disappearing with age. Nostrils white or pinkish. Upper part of pectoral base generally blackish. Fins lighter or darker brown or greyish. Length 235 mm.

Habitat: New Guinea (Merauke!). In brackish water.

9. **Sphoeroides honckeni** (Bl.)

Tetrodon Honckenii Bloch, Ausländ. Fische I, 1785, p. 133.
Tetrodon Honckenii Bloch Schneider, Syst. Ichth. 1801, p. 504.
Tetrodon atratus Richardson, Voyage Samarang, Zool. Fishes, 1848, p. 15.
Gastrophysus Honckenii Bleeker, Nat. Tijdschr. Ned. Indië VII, 1854, p. 258.
Tetraodon Honckenii Bleeker, Atlas Ichth. V, 1865, p. 60.
Tetrodon honckenii Günther, Cat. Brit. Mus. VIII, 1870, p. 276.
Tetrodon honckeni Barnard,. Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 970.
Amblyrhynchotes honckenii J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 418.

D. 2. 8-9. A. 2. 6. P. 1. 13-14.

Head 2.7-3, 3.5-3.7 in length with caudal. Eye 3.5-4.9, 1.5-2.15 in snout and 1.27-2.68 in flat or slightly concave interorbital space, situated above level of mouth, superiorly without free orbital rim. Nasal organ a raised papilla with two openings near the top, the anterior one facing tip of snout, the posterior one facing eye. Chin prominent. Upper lateral line running from eye along upper part of sides to upper half of base of caudal. Lower lateral line inconspicuous, except on caudal peduncle where it runs along a feeble skin fold. Prickles on occiput, anterior part of back and upper part of sides, not reaching dorsal. Underside with prickles, except chin and tail. Dorsal and anal somewhat pointed, the median rays longest, those of dorsal 1.5-2, those of anal 1.7-2 in head. Origin of anal below posterior rays of dorsal. Pectorals rounded, 1.7-2 in head. Caudal slightly rounded. Least depth of caudal peduncle 2-2.26 in its length. Colour of preserved specimens bluish black above with many larger and smaller round or oval white spots, creamy below, the two colours rather sharply separated. Dorsal yellowish, its basal part and anterior half more or less bluish black or dusky. Anal creamy. Pectorals creamy, the rays more or less dusky. Caudal creamy in its basal third, for the rest bluish black. Length 300 mm (specimens of Bleeker's collection in the Leiden Museum examined).

Habitat: Borneo!; Celebes (Makassar, Maros!). — Cape of Good Hope to Natal!, Zanzibar, Madagascar, Mauritius, Tranquebar?, China.

10. **Sphoeroides florealis** (Cope)

Tetrodon florealis Cope, Trans. Am. Philos. Soc. XIV, 1871, p. 479.
Tetrodon hypselogenion Day, Fishes of India, Part IV, 1878, p. 702 (nec Blkr)
Spheroides florealis Fowler, Proc. Acad. Nat. Sci. Philadelphia 1900, p. 514, pl. XX, fig. 4.
Tetrodon brevipinnis Regan, Proc. Zool. Soc. London 1902, II, p. 300.
Lagocephalus hypselogeneion Evermann & Seale, Bull. Bur. Fish. XXVI (1906) 1907, p. 100 (nec Blkr).
Sphoeroides hypselogenion Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 468 (nec Blkr).

D. 8. A. 7. P. 15.

Head 2.7, 3.4 in length with caudal. Eye 3.77, 1.44 in snout and more than almost flat interorbital space. Eye superiorly without free orbital margin. Nasal papilla moderately elevated, with 2 nostrils. Chin not prominent. Rather distant prickles, on all parts of head, and on the body nearly to the dorsal fin on the back and on underside from chin to anus. A very feeble raised skin fold along tail. Dorsal and anal very narrow, somewhat falcate, the base of the dorsal 3.4 in its length. Origin of anal below end of dorsal. Longest dorsal rays twice in head, longest anal rays 2.8 in head, longest pectoral rays 2.4 in head. Caudal slightly emarginate. Colour of preserved specimen: Upper side reticulated with dark brown, the network enclosing light spots. Cheeks with vertical, more or less oblique, narrow, brown bands. Sides yellow. Lower side white, more or less silvery on tail. Caudal with about 6 or 7 transverse brown bands. Length of specimen described (the type of *T. brevi-*

pinnis, examined by me in the British Museum) 58.5 mm. The species can attain 150 mm (Day).

Habitat: Celebes! — Coasts of India, Philippines, Marshall Islands, New Hebrides, Funafuti, Hawaii.

11. **Sphoeroides hypselogeneion** (Blkr.)

Tetrodon honckenii Rüppell, Atlas Reise N. Afrika, Fische, 1828, p. 65 (nec Bl.).

Gastrophysus poecilonotus Rüppell, Verzeichn. Mus. Senckenb. Naturf. Ges. Samml. IV, Fische, 1852, p. 34 (nec Schl.).

Tetraodon hypselogeneion Bleeker, Verh. Bat. Gen. XXIV, 1852, Bijdr. kennis blootkak. visschen, p. 24. — Nat. Tijdschr. Ned. Indië III, 1852, p. 300.

Arothron hypselogeneion Bleeker, Nat. Tijdschr. Ned. Indië XVII, 1858-1859, p. 151.

Tetraodon hypselogeneion Bleeker, Atl. Ichth. V, 1865, p. 61.

Tetrodon hypselogenion Günther, Cat. Brit. Mus. VIII, 1870, p. 277 (pro parte).

Tetrodon poecilonotus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 637 (nec Schl.).

Spheroides hypselogeneion Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 368.

Tetrodon hypselogeneion Günther, Fische der Südsee III, 1910, p. 462.

Spheroides hypselogeneion Herre, Philipp. Journ. Sci. 25, No 4, 1924, p. 485 (sine syn.).

Tetrodon hypselogeneion Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 970 (sine syn.).

Sphaeroides hypselogenion Tortonese, Boll. Mus. Zool. Anat. Comp. Torino XLIV, 1935-1936, p. 62.

Amblyrhynchotes hypselogeneion J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 418.

D. 2. 6-7. A. i. 5-6. P. 1. 11. 1 or 2. 12. 1.

Head 2.46-2.9, 3.14-3.6 in length with caudal. Eye 3.5-4.9, 1.5-2.1 in snout, more than interorbital space in young and 1.77-2.1 in aduts. Eye superiorly without free orbital margin. Chin prominent. Prickles from interorbital space to back, not reaching origin of dorsal, on sides of head, sides of body and belly, not reaching anal. Base of dorsal 2-2.5 in its height, origin of anal below that of dorsal. Longest dorsal rays 2.1-2.6 in head, longest anal rays 2.6 in head. Longest pectoral rays 2.3 in head. No raised keel on caudal peduncle. Colour of preserved specimens dark brown above, mottled with greyish, sharply demarcated from white sides and lower parts. Three dark vertical bands on head, the first before eye, the second below eye and the third behind eye. Length 175 mm. (Specimens of Bleeker's collection in the Leiden Museum examined).

Habitat: Bali; Celebes (Menado, Tombariri); Batjan; Ambon; Ceram; New Guinea (Daugo Island). — Coast of East Africa!, Zanzibar, Seychelles, Cargados Carajos, Red Sea, Ceylon, Japan, Philippines, New Hebrides, Australia, Lord Howe Islands, Ellice Islands, Fidji, Samoa, Pearl and Hermes Reef, Hawaii. In sea.

12. **Sphoeroides richei** (Frém.)

Tetrodon richei Fréminville, Nouv. Bull. Philom. II, 1813, p. 250.
Chelonodon Richei Rüppell, Samml. Senckenberg. Mus. 1852, p. 55.
Gastrophysus Richei Bleeker, Verh. Akad. Amsterdam II, 1855, p. 24.
Tetraodon Richei Bleeker, Atl. Ichth. V, 1861, p. 61.
Tetraodon richei Kner, Novara Exp. Fische, 1865-1867, p. 407.
Tetrodon richei Günther, Cat. Brit. Mus. VIII, 1870, p. 285.
Tetrodon richei Hutton, Cat. Fishes New Zealand, Col. Mus. 1872, p. 72.
Tetrodon Richei Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 275.
Tetrodon Richei A. B. Meyer, Anal. Soc. Esp. Hist. Nat. XIV, 1885, p. 47.
Spheroides richei Jordan & Snyder, Proc. U. S. Nat. Mus. XXIV, 1901, p. 248.
Spheroides richei Fowler, Proc. Ac. Nat. Sci. Philadelphia LIX (1907) 1908, p. 439.
Tetrodon richei Waite, Rec. S. Austr. Mus. II, No. 1, 1921, p. 196.
Contusus richei Whitley, The Austr. Zoologist 11, Part 2, 1947, p. 147.

D. 2. 7 or 3. 7. A. 2. 7-8. P. 1. 13.

Head 3-3.75. Eye 3-3.5, about 1.6 in interorbital space. Eye all round with a free orbital margin. Chin not prominent. Head, body, and tail covered with short prickles, excepting the lips and the bases of the fins. No raised skin fold along the tail. Dorsal and anal higher than their bases. Colour rather dark above, white below. Black saddles or blotches on upper part of head, back, and tail. Length 200 mm.

Habitat: Java?; New Guinea (Rubi). — Japan. Coasts of Australia, Tasmania and New Zealand.

Note. I have only seen a specimen of Bleeker's collection in the Leiden Museum in rather poor condition. It is uncertain if this species occurs in the Indo-Australian Archipelago. Rüppell's record (l.c.) from Java is probably erroneous as it has never been found again there. Bleeker (Atl. Ichth. l.c.) moreover doubts if Rüppell's specimen belongs to *richei*, as he ranges it under *Chelonodon*. The other locality in the Indo-Australian Archipelago from where *richei* has been recorded is Rubi in New Guinea by A. B. Meyer l.c. Fowler (Mem. B. P. Bishop Mus. X. 1928, p. 467) says that possibly this reference may refer to *S. lunaris*, but I don't know on what ground.

4. **Chelonodon** Müller

(Johannes Müller, Abh. Akad. Wiss. Berlin 1839, p. 252)

Nasal organ a depression surrounded by a low rim, produced into a posterior and an anterior flap. Sides naked.

Distribution: A few Indo-Pacific species.

Chelonodon patoca (H. B.). (Fig. 86, p. 390)

Tetrodon patoca Hamilton Buchanan, Fishes Ganges 1822, p. 7.
Tetrodon dissutidens Cantor, Journ. Asiat. Soc. Bengal XVIII, Part 2 (1849) 1850, p. 1364.
Tetraodon kappa Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootkak. visschen, p. 16. — Nat. Tijdschr. Ned. Indië III, 1852, p. 301. — Verh. Bat.-Gen. XXV, 1853. Nalez. ichth. fauna Bengalen, p. 160.
Arothron? kappa Bleeker, Nat. Tijdschr. Ned. Indië XII, 1856, p. 218.
Cheilichthys kappa Bleeker, Versl. Akad. Amsterdam XIV, 1862, p. 103.
Chelonodon kappa Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 31.
Leiodon patoca Bleeker, Atl. Ichth. V. 1865, p. 76.
Tetrodon patoca Günther, Cat. Brit. Mus. VIII, 1870, p. 288.
Tetrodon patoca Day, Fishes of India, Part IV. 1878. p. 703.
Tetrodon patoca Macleay, Descr. Cat. Austr. Fish II, 1881, p. 275.
Tetrodon patoca Vinciguerra, Ann. Mus. Civ. Genova (2) IX, 1890. p. 359.
Chelonodon patoca Herre, Philipp. Journ. Sci. 25, No. 4. 1924, p. 487.
Tetrodon patoca Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 973.
Chelonodon patoca Fowler, Mem. B. P. Bishop Mus. X. 1928, p. 472.
Tetrodon patoca Duncker & Mohr, Mitt. Zool. Mus. Hamburg 44, 1929, p. 78.
Chelonodon patoca Whitley, Rec. S. Austr. Mus. V, No. 3, 1935, p. 356.
Chilonodon patoca Blegvad, Danish Sci. Inv. Iran, Prt III, 1944, p. 219.
Chelonodon patoca H. M. Smith, U.S. Nat. Mus. Bull. 188, 1945, p. 574.
Chelonodon patoca J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 419.

D. 2. 7-2. 8 (9). A. 2. 6 or 1. 7. P. 2. 14 or 1. 13. 1.

Head 2.6-2.95, 3.2-3.8 in length with caudal. Eye high, but not interfering with upper profile of head, 3-4.3, 1.1-1.8 in snout and 1.5-2.2 in almost flat interorbital space. Upper profile of snout to caudal evenly arched. Nasal organs a round depression before each eye, surrounded by a low rim which is produced into a short, more or less triangular flap anteriorly and posteriorly. Upper lateral line bent downwards below dorsal, lower lateral line running along lower

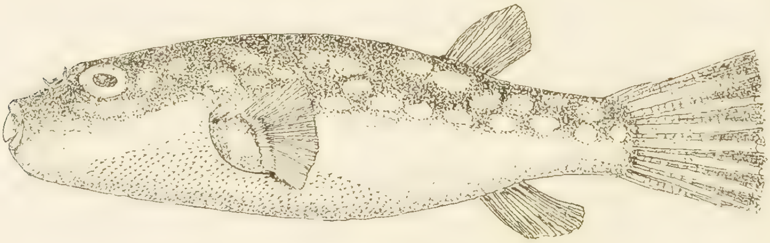

Fig. 86. *Chelonodon patoca* (Ham. Buch.) × 5/8.

half of tail, along a feeble ridge; the lateral lines often inconspicuous. Skin naked with exception of a spiny patch on back, beginning behind interorbital space and not reaching origin of dorsal, and a similar patch on throat and belly, not reaching anus. Dorsal and anal somewhat rounded, the longest dorsal rays 1.8-2.2. the longest anal rays 2-2.2 in head. Origin of anal somewhat behind that of dorsal. Pectorals somewhat rounded, the longest rays 2.4-2.7 in head. Caudal slightly rounded. Least depth of caudal peduncle 1.3-1.8 in its length measured from anal. Colour of preserved specimens: Back and sides brown or bluish grey, in young with broad darker transverse bands, the first running over interorbital space, the second above base of pectorals, the third below dorsal. Back and sides with more or less distinct rounded white blotches. Lower half of head, body, and tail white, more or less silvery on the sides. Dorsal, anal, and pectorals white or yellow, caudal more or less dusky. Length 330 mm.

Habitat: Singapore; Sumatra (Trussan, Padang, Priaman, Siboga); Nias!; Bintang; Banka; Java (Jakarta, Wijnkoop Bay, Palabuan Ratu, Surabaya, Batu Ulu!); Bali; Bawean; Borneo (Sandakan); Celebes (Makassar!, Badjoa, Tanawanko, Gorontalo); Sulu Islands; Sumbawa!; Flores!; Buru; Ambon!; Ceram!; Batjan; Ternate!; Kei Islands; Waigeu!; New Guinea (mouth of Mamberano River!). — East coast of Africa as far south as Port Alfred, Beira!, Madagascar, Gulf of Iran, India, Ceylon, Andamans, Burma, Siam, Malaya, Tonkin, Formosa!, China, Philippines, North Australia, Trobiand Islands, Admirality Islands, New Britain. In sea and estuaries, ascending rivers.

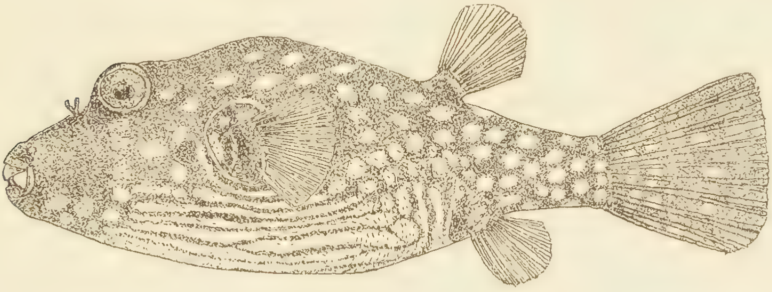

Fig. 87. *Tetradon hispidus* L. × $^3/_5$.

Tetraodon Linné

(Linné, Systema Naturae, Ed. X. 1758, p. 332)

Ovoides Cuvier, Leçons d'Anatomie Comparée, 1800, p. 1.

Arothron Müller, Abh. Akad. Wiss. Berlin, 1839, p. 252.
Monotreta (Bibron) Hollard, Ann. Sci. Nat. VIII, 1857.

Nasal organ a single or bifid elevated tube. Sides with prickles.

Distribution: Indo-Pacific.

Key to the Indo-Australian species of Tetraodon

A. Nasal organ a tube with a single nostril at its end. Inferior border of eye in level with mouth (*Monotretus*).
  a. D. 11-14. A. 10-12. P. 18-23.
    a^{1}. Body and tail with more or less distinct large dark reticulations. Black blotches or ocelli on sides. Caudal uniform . . . . 1. *T. palembangensis* p. 393.
    b^{1}. Body and tail with large blotches, generally much larger than interspaces, or with a single ocellus below origin of dorsal. Caudal uniform . . 2. *T. leiurus* p. 394.
    c^{1}. Back, sides, and tail with dark blotches. Belly white. Caudal with vertical narrow bands . . . . 3. *T. fluviatilis* p. 395.
  b. D. 10-11. A. 9. P. 17-19. No blotches or reticulations, Back dark, sides and belly light . . . . 4. *T. erythrotaenia* p. 397.
  c. D. 11. A. 10. P. 15. Back dark, underside light. A light band connecting eyes, another band from eye to back, meeting its fellow in mid-dorsal line . . . . . 5. *T. borneensis* p. 398.
  d. D. 10-13. A. 9-11. P. 17-20. Black spots on back and sides. A black occipital chevron. Ventral surface white. . . . . 6. *T. kretamensis* p. 398.
B. Nasal organ two thick tentacles, united basally and with or without a short stem.
  a. Back, sides, tail, and caudal with dark spots, underside light or with dark oblique bands anteriorly . . . . 7. *T. stellatus* p. 399.
  b. Back, sides, tail, and caudal dark with white spots, underside light with dark longitudinal bands.
    a^{1}. The dark bands ascending to cheeks and snout. Least depth of caudal peduncle more than its length. . 8. *T. reticularis* p. 401.
    b^{1}. Cheeks and snout dark with white spots. Least depth of caudal peduncle less than its length .. . . 9. *T. hispidus* p. 402.
  c. Head, back, tail, and caudal, and in young specimens also the lower sides, with dark reticulations . . . . 10. *T. mappa* p. 404.
  d. Caudal dark, body uniform or with longitudinal stripes . . . . 11. *T. immaculatus* p. 405.

e. Small, round, black spots scattered on
sides of head, body, and tail . . . . . 12. *T. nigropunctatus* p. 408

1. **Tetraodon palembangensis** Blkr

Tetraodon palembangensis Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 25. — Nat. Tijdschr. Ned. Indië III, 1852, p. 605.
Crayracion palembangensis Bleeker, Atlas Ichth. V, 1865, p. 67.
Tetrodon palembangensis Günther, Cat. Brit. Mus. VIII, 1870, p. 288.
Tetrodon pinguis Vaillant, Notes Leyden Museum XXIV, 1902, p. 30.
?*Tetraodon palembangensis* Hora, Journ. Nat. Hist. Soc. Siam VI, No. 2, 1923, p. 183. — Mem. Asiat. Soc. Bengal VI, 1924, p. 499.
Tetraodon palembangensis Meinken, DATZ, IX, 3, p. 1956, p. 61,

D. 2. 11 or 1. 12. A. 1. 10 or 2. 9. P. 2. 18 or 1. 20.

Head 2.2, 2.5-2.6 in length with caudal. Eye 4.4-5, its lower border in level of mouth, 1.7 in snout and 1.7-2 in the narrowest anterior part of the flat interorbital space. Nasal organ a tentacle above eye, ending in two, sometimes three, short, flat lobes. With exception of the surroundings of the mouth and of the caudal peduncle the skin is covered with small spines. Lateral line forming a distant ring round eye, running in a curved line along black, descending above and behind pectoral to anterior part of caudal peduncle, where it ends at a point nearer to the ventral than to the dorsal profile. Dorsal rounded, the longest rays 3.4-4.4 in head Anal rounded, the longest rays 4-4.1 in head. Pectorals with a long base, slightly rounded, the longest rays 4.2-4.6 in head. Caudal rounded. Least depth of caudal peduncle 1.3-1.6 in its length measured from anal. Colour of preserved specimens light brown, whitish on lower side. Sides of head, body, and tail with black or dark brown rounded blotches, these blotches encircled at some distance by light brown bands which are more or less distinctly connected by similar bands, forming wide meshes or reticulations which are more or less distinct on the back. Fins yellowish, the caudal darker. Length 231 mm.

Nomen indig. Bontal (Palembang).

Habitat: Singapore?; Sumatra (Palembang!, Moarah Kompeh, Gunung Sahilan!, Taluk!, Padang, Kwantan River, Indragiri, Upper Langkat, Nagu Asin); Borneo (River Kapuas, Mandhor, Danau Sriang, Sinkawang, Mahakam River). — Siam, Indochina, In rivers.

Note. I have examined the type and only specimen known of *T. pinguis* in the Leiden Museum. According to Vaillant (l.c.) this species chiefly differs from *palembangensis* in having a narrower snout and in having less rays in the dorsal and anal. The dorsal, however, which has 9 rays, seems to be mutilated and the anal has 10 rays, hence one less than normal. The rays are difficult to count as the skin, not only of the fins but of the whole fish, is very thick, possibly swollen through the preservative. The coloration, according to Vaillant, is that of *palembangensis,* but there is but a single large black blotch on the side ,at some distance behind the pectoral. I do not think this last difference from typical specimens of *palembangensis* is of great importance, as in some specimens of the closely related *T. leiurus* too the blotches on the sides can be restricted to a single one. The specimens recorded by Hora (l.c.) also differ in coloration from typical *palembangensis,* but then I am not sure that they belong to this species.

2. **Tetraodon leiurus** Blkr

Tetraodon leiurus Bleeker, Tijdschr. Ned. Indië I, 1850, p. 97. — Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 22. — Nat. Tijdschr. Ned. Indië III, 1852, p. 440.
Arothron leiurus Bleeker, Nat. Tijdschr. Ned. Indië XVI, 1858-1859, p. 48.
Crayracion leiurus Bleeker, Atlas Ichth. V, 1865, p. 67.
Tetrodon liurus Günther, Cat. Brit. Mus. VIII, 1870, p. 288.
Tetrodon Hilgendorfii Popta, Notes Leyden Mus. XXV, 1905, p. 185. — Ibid. XXVII, 1906, p. 211.
Tetrodon Bergii Popta, ibid. XXV, 1905, p. 186. — Ibid. XXVII, p. 215.
Tetraodon liurus Hora, Journ. Nat. Hist. Soc. Siam VI, No. 2, 1923, p. 184. — Mem. Asiat. Soc. Bengal VI, 1924, p. 500.
Tetrodon leiurus Fowler, Proc. Acad. Nat. Sci. Philadelphia 89, 1937, p. 264.
Tetraodon leiurus H. M. Smith, U. S. Nat. Mus. Bull. 188, 1945, p. 577.

D. 2. 11-2.12 or 3. 11. A. 1. 9 or 2. 9 or 1. 10. P. 1. 20 or 2. 20-22.

Head 2.3-2.5, 2.8-3.27 in length with caudal. Eye slightly above level of mouth, 5-5.6, 2.4-2.7 in the rather produced snout and 2.2-3 in the scarcely convex or flat interorbital space. Nasal organ in front of eye, consisting of a compressed tentacle, bifid at its end. Interorbital space, back to dorsal, throat, belly, and sides of body with very small spines; snout, chin, and tail, naked. Lateral line curved upwards to above pectoral and then down again to middle of caudal peduncle. Dorsal and anal slightly rounded, the median rays longest and 2.8-3.5 in head. Origin of anal below middle of dorsal. Pectorals slightly rounded, the longest rays 3.1-3.7 in head. Caudal rounded. Least depth of caudal peduncle 1.26-1.3 in its length, measured from anal. Colour of preserved specimens brown above, yellowish white below. Head, back ,sides ,and tail with crowded, large, black, light edged ocelli, not always distinct on back and head, or only conspicuous on sides, or uniform with a single black, white edged ocellus on middle of sides below origin of dorsal. Length 140 mm.

Habitat: Singapore; Sumatra (Deli!, Padang, Lake of Singkarah!, Solok, Palembang, Lahat); Java (Jakarta, Bogor!, Preanger); Borneo (Prabukarta, upper course of River Kapuas, Bongan, middle course of River Mahakam, Lebang Hara, Soengei Serawai!). — Malay Peninsula, Siam. In rivers.

Note. Hora (l.c.) records specimens from Siam which have only one ocellus below origin of dorsal in stead of the many blotches or ocelli which cover the back and sides in typical specimens. There is a similar specimen from Deli, Sumatra, in the Amsterdam Museum. It is not a geographical colour variety, as Fowler records typical specimens from Siam.

I have examined the typical specimens of *T. Hilgendorfii* in the Leiden Museum. Miss Popta (l.c.) says that this species differs from *leiurus* by the length of the head, the lower and more advanced situation of the eye and by the coloration. The head goes 2.3-2.5 in the standard length, hence the same as in the specimens of *leiurus* seen by me. I don't see any important difference in the situation of the eye and the coloration which, as we have seen, is very variable in this species, is dark above, sides with longitudinal rows of oblong dark blotches, sometimes extending on the belly, hence not principally different from that of typical *leiurus*.

I also examined the single specimen known of *T. Bergii* in the Leiden Museum which ,acording to Miss *Popta,* differs from *leiurus* in the length of the head, the width of the interorbital space, the lower situation of the eye and the coloration. The only difference with *leiurus* I can find is the coloration which is greyish blue above, yellowish below, without anay dark blotches. Apparently the specimen was in poor condition, having suffered from parasites which had formed pustules on head and body and this may be the reason of its abnormal coloration.

Tetraodon leiurus brevirostris Benl (DATZ X, No. 3, 1957, p. 63) differs from typical *leiurus* by a shorter snout. The locality of the type, an aquarium fish, is unknown but may be Thailand. The specimens of *leiurus* from the Indo-Australian Archipelago examined by me are long snouted and hence typical *leiurus*.

3. **Tetraodon fluviatilis** H. B.

Tetrodon fluviatilis Hamilton Buchanan, Fishes of the Ganges, 1822, p. 6.

Tetraodon potamophilus Bleeker, Verh. Bat. Gen. XXII (1848) 1849. Bijdr. kennis ichth. fauna Madura, p. 16.

Tetrodon simulans Cantor, Journ. Asiat. Soc. Bengal XVIII, Part II (1849) 1850, p. 1356.
Tetraodon potamophilus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 10, p. 17.
Tetraodon Waandersi Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 194.
Arothron potamophilus Bleeker, Acta Soc. Sci. Indo-Neerl. III, 1858. Elfde bijdr. kennis ichth. fauna Borneo, p. 2.
Crayracion fluviatilis Bleeker, Atlas Ichth. V, 1865, p. 68.
Leiodon Waandersi Bleeker, ibid. p. 76.
Crayracion fluviatilis Kner, Novara Exp. Fische, 1865-1867, p. 408.
Tetrodon fluviatilis Günther, Cat. Brit. Mus. VIII, 1870, p. 299.
Tetrodon fluviatilis Day, Fishes of India, Part IV, 1878, p. 707.
Tetrodon fluviatilis Vinciguerra, Ann. Mus. Civ. Genova (2) IX, 1890, p. 360.
Tetrodon fluviatilis Regan, Proc. Zool. Soc. London 1902, II, p. 302.
Tetraodon fluviatilis Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 497.
Tetrodon fluviatilis Vinciguerra, Ann. Mus. Civ. Genova (3) X, 1926, p. 536.
Dichotomycter fluviatilis Fowler, Proc. Acad. Nat. Sci. Philadelphia 89, 1937, p. 264.
Tetraodon fluviatilis H. M. Smith, U.S. Nat. Mus. Bull. 188, 1945, p. 577.
Chelonodon fluviatilis Munro, The marine and fresh water fishes of Ceylon, 1955, p. 282.

D. 3. 9-3. 11. A. 2. 8-2. 10. P. 2. 16-2. 20.

Head 2.48-2.6, 3.1-3.4 in length with caudal. Eye in level of mouth, 3.87-3.93, 1.46-1.6 in snout and 1.8-2.26 in somewhat convex interorbital space. Upper profile from snout to caudal evenly arched. Nasal organ close before superior half of eye, consisting of a short stem with two rounded lobes at its top. Lateral line inconspicuous. Distant, short, two rooted spines on posterior sides of head, anterior part of sides of body and belly; rest of head, back, posterior part of sides of body and entire tail, naked. Dorsal and anal rounded, the median rays longest and 2.36-2.9 in head. Origin of anal below that of dorsal. Pectorals rounded, the anterior rays longest and 2.36-3.3 in head. Least depth of caudal peduncle 1.03-1.25 in its length. Caudal rounded. Colour of preserved specimens light brown above, white below. Upper side of head, back, upper part of sides of body and entire tail with large, dark brown blotches. Dorsal, anal, and pectorals light yellowish hyaline, caudal yellowish hyaline with brown, parallel, vertical, narrow bands. Length 158 mm.

Nomen indig. Buntel mas.

Habitat: Pulu Weh!; Singapore; Sumatra (Siboga, Deli!, Bagan Si Api Api); Bintang; Banka; Java (Jakarta!, Perdana, Bantam, Krawang, Tjikao, Tjilatjap!, Samarang, Surabaya); Madura; Borneo (Sarawak, Seminju, Sandakan, Tawau, Sambas, Pamangkat, Sinkawang, Sungiduri, Pontianak, River Kapuas, Bandjermasin, Kumai River, Mahakkam River!). — India, Ceylon, Andamans, Burma, Siam, Malay Peninsula, Cochinchina, Philippines. In sea and estuaries, entering fresh water.

4. **Tetraodon erythrotaenia** Blkr

Tetraodon erythrotaenia Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 174.
Arothron erythrotaenia Bleeker, Acta Soc. Sci. Indo-Neerl. VIII, 1860. Dertiende bijdr. kennis vischfauna Celebes, p. 12.
Crayracion erythrotaenia Bleeker, Atlas Ichth. V, 1865, p. 68.
Tetrodon erythrotaenia Günther, Cat. Brit. Mus. VIII, 1870, p. 298.
Tetrodon erythrotaenia M. Weber, Abh. Senckenb. naturf. Ges. XXXIV, 1911, p. 48.
Tetrodon erythrotaenia Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 471.

D. 2.8-2.9 or 3.7-3.8. A. 1.8-2.7 P. 1.16-2.17.

Head 2.39-2.66, 2.9-3.28 in length with caudal. Eye in level of mouth, 3.2-3.8, 1.2-1.8 in snout and 1.2-2.1 in slightly convex or almost flat interorbital space. Upper profile from snout to caudal evenly, but only slightly, arched. Nasal organ before middle of eye, consisting of a short tube ending in two rounded lobes. Lateral line inconspicuous. Posterior part of head, back and sides of body with distant spines, often concealed below the skin. Dorsal rounded, the longest rays 2.1-2.9 in head. Anal rounded, the longest rays 2.6-2.9 in head. Origin of anal below that of dorsal. Pectorals rounded, the longest rays 2.6-2.9 in head. Caudal rounded. Least depth of caudal peduncle 1.12-1.4 in its length, measured from anal. Colour of preserved specimens dark leaden grey above and creamy white below, the two colours separated by a black longitudinal band from snout to tail; in life this band is bordered by a brick red band below it. In specimens from New Guinea, the Key and the Aru Islands this red band is again bordered below by a black band and the red band is often broken into a row of spots; the lower side may be grey or even blackish in these specimens. Length 85 mm.

Habitat: Celebes (Maros); Ambon!; Guébé; Kei Islands!; Aru Islands!; New Guinea (Lorentz River!). In fresh and brackish water.

Note. Weber, l.c., pointed out that Bleeker erroneously states that the nasal tentacle is simple and not bilobated. Moreover, in his earlier description of the species, Bleeker describes this tentacle as bilobated.

The species described by Kner (Novara Exp. Fische, 1865-1867, p. 408) as *Crayracion erythrotaenia* is not this species. McCulloch (Austr. Zoologist II, Part III, 1922, p. 130) supposes that it belongs to *Tetrodon pleurogramma* Regan.

5. **Tetraodon borneensis** Regan

Tetraodon borneensis Tate Regan, Proc. Zool. Soc. London 1902, II, p. 303.

D. 2. 9 or 1. 10. A. 2. 8 or 1. 9. P. 15.

Rather compressed, a faint dorsal keel. Height 2.3-2.4, 2.89-2.9 in length with caudal. Eye in or even below level of mouth, covered by skin, 3.77-4, 1.44-1.66 in snout and 1.5-1.66 in convex interorbital space. Nasal organ midway between eye and end of snout, consisting of a short, elevated tube with a single terminal aperture. Head, except the snout, and body with small prickles. Dorsal and anal rounded, the longest dorsal rays 3 in head, longest anal rays slightly shorter. Origin of anal slightly behind origin of dorsal. Pectorals slightly rounded, the longest rays 4 in head. Caudal rounded. Caudal peduncle as deep as long. Colour of preserved specimens brown above, underside of head and body whitish, pinkish in median ventral line from chin to anus. Upper part of head dark brown. A light, transverse band connecting eyes over interorbital space. A similar, less distinct band from eye to point of snout, the bands of both sides enclosing a triangular dark patch on snout. A light, rather broad band on each side from hindmargin of eye runs back to meet its fellow in the mid-dorsal line forming here a light triangular patch, the top directed in caudal direction, the basis forming the posterior border of a dark square patch, the anterior border of which is formed by the band on the interorbital space. Caudal light brown with a terminal white and a subterminal dark band or uniform bluish grey. Length 56.5 mm (not 70 mm as stated by Regan). Description made after the type and paratype, examined by me in the British Museum.

Habitat: Borneo (Sarawak!).

6. **Tetraodon kretamensis** Inger

Tetraodon kretamensis Inger, Fieldiana, Zoology 34, No. 11, 1953, p. 149.

D. 2-3, 8-11. A. 1-2, 7-9. P. 2. 15-18.

Head 2.10-2.36, 2.84 in length with caudal. Eye 3.68, 1.37 in snout, its longitudinal axis slightly above line connecting upper end of branchial opening and corner of mouth. Dorsal profile rising steeply to interorbital space, more gradually to point above end of pectorals, sloping downward to center of caudal peduncle. Lips plicate, very thick. Nasal apparatus a solid oblong tentacle bifid in distal two-thirds, apposed surfaces of terminal lobes smooth. Lateral line system indistinct, a line across snout between nasal tentacles and mouth, a supraorbital line strongly curved inward, a transverse occipital line curving backward from hind corner of eyes, a lateral line arching high above pectoral and becoming invisible anterior to level of dorsal. Erectile spines with bifid base covering back, sides, and belly anterior to level of vent, top of head and throat to anterior level of eyes, and sides of head behind eyes. Origin of dorsal equidistant from end of pectoral and mid-base of caudal, margins rounded. Anal origin opposite to that of dorsal, margin rounded. Pectorals broad, base slightly off vertical, in mid-line, margin feebly rounded, third and fourth branched rays the longest, subequal to eye. Colour (in life) olive-green dorsally and laterally, with round and oblong black spots of varying sizes. A black occipital chevron almost always present; a partially interrupted ventro-lateral black stripe running from mouth below eye and pectoral and fading anterior to vent. Some specimens have an interorbital bar, others only a spot. Occasionally spots coalesce to form a partial or complete cross on the back. Ventral surface of head and trunk anterior to vent white. Fins unmarked, caudal dusky. Length 60 mm (After Inger, not seen by me).

Habitat: Borneo (Kretam kechil River).

Note. This species seems to be similar to *T. erythrotaenia,* differing in coloration and in a different distribution of the prickles.

7. **Tetraodon stellatus** Bl. Schn.

Tetrodon lineatus Bloch, Ausländ. Fische I, 1785, p. 128 (nec L.).
Tetrodon lagocephalus var. *stellatus* Bloch Schneider, Syst. Ichth. 1801, p. 503.
Tetrodon pseudopterus Bloch Schneider, ibid. p. 508.
Tetrodon commersoni Bloch Schneider, l.c.
Tetraodon calamara Rüppell, Atlas Reise N. Afrika, Fische, 1828, p. 64.
Tetrodon aerostaticus Jenyns, Zool. Voyage Beagle, Fishes, 1842, p. 152.
Tetrodon cinctus Richardson, Zool. Voyage Samarang, 1848, p. 20.
Tetrodon lineatus Schlegel, Fauna Japonica, Pisces. 6. 1850, p. 287 (nec L.).
Tetraodon calamara Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 15.
?*Tetraodon astrotaenia* Bleeker, Nat. Tijdschr. Ned Indië IV, 1853, p. 129.
Arothron lineatus Bleeker, Acta Soc. Sci. Indo-Neerl. I, 1856, Beschr. nieuwe vischsoorten Amboina, p. 67 (nec L.).
Arothron calamara Bleeker, ibid. VIII, 1860. Achtste bijdr. kennis vischfauna Sumatra, p. 65.
?*Crayracion astrotaenia* Bleeker, Atlas Ichth. V, 1865, p. 69.
Crayracion lineatus Bleeker, ibid. p. 70 (nec L.).
Crayracion stellatus Bleeker, ibid. p. 73.
Crayracion lineatus Kner, Novara Exp. Fische, 1865-1867, p. 409.
Tetrodon stellatus Günther, Cat. Brit. Mus. VIII, 1870, p. 294.
Tetrodon stellatus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 644.
Tetrodon stellatus Day, Fishes of India, Part IV, 1878, p. 705.

Tetraodon aerostaticus Jordan & Snyder, Proc. U.S. Nat. Mus. XXIV, 1901. p. 250.

Tetrodon stellatus Seale, Occas. Papers B. P. Bishop Mus. I, 1901, p. 119.

Tetraodon aerostaticus Fowler, Proc. Acad. Nat. Sci. Philadelphia LV, 1903, p. 164.

Tetraodon aerostaticus Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 368.

Tetrodon stellatus Annadale & Jenkins, Mem. Indian Mus. III, No. 1, Part III, 1910, p. 15.

Tetrodon stellatus Günther, Fische der Südsee III, 1910, p. 465.

Tetraodon aerostaticus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 495.

Tetrodon aerostaticus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 974.

Tetrodon stellatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 469.

Ovoides aerostaticus Whitley, Sci. Rep. Great Barrier Reef Exp. Br. Mus. IV, No. 9, Fishes, 1932, p. 311.

Tetrodon stellatus Tortonese, Boll. Mus. Zool. Anat. Comp. Univ. Torino XLV, 1935-1936, p. 61.

Tetrodon stellatus Fowler, Proc. Acad. Nat. Sci. Philadelphia 87, 1936, p. 408. — Hongkong Naturalist 6. Suppl. 1938, p. 51.

Tetraodon stellatus Blegvad, Danish Sci. Inv. Oran, Part III, 1944, p. 218.

Arothron stellatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 420.

Arothron aerostaticus J. L. B. Smith, l.c.

Arothron stellatus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 283.

Arothron aerostaticus Munro, l.c.

D. 1. 10. A. 2. 9. P. 2. 17.

Dorsal profile arched, upper profile of snout slightly concave. Head 2.39, 2.8 in length with caudal. Eye high, above level of mouth, but not interfering with upper profile of head, 5, 2.18 in snout and 2.18 in flat interorbital space. Nasal organs each consisting of a short stem and two lobes, situated before eye. Head and body entirely covered with small spines, the lips being naked. Tail posteriorly naked. Lateral lines inconspicuous. Dorsal and anal rounded, the longest rays 3.5 in head. Pectorals rounded, the longest rays 2.9 in head. Origin of anal behind that of dorsal. Caudal rounded. Least depth of caudal peduncle 1.18 in its length, measured from anal. Colour of preserved specimens light brown above, whitish below. Anus in a black patch. Upper part and sides of head, body, tail, and caudal fin with numerous black spots. Lower side either immaculate (*stellatus*) or with more or less developed oblique black bands which may be narrower or broader than the interspaces (*aerostaticus, lineatus* Bl.). Dorsal and pectorals either spotted as the caudal, or without spots as the anal. Base of pectorals generally with large black blotches. Length 900 mm.

Habitat: Singapore; Sumatra (Atcheen!, Padang); Nias;

Java (Jakarta); Bali; Borneo (Sandakan); Celebes (Menado); Ceram; New Guinea. — East coast of Africa, as far south as Knysna, Mozambique!, Zanzibar, Madagascar, Seychelles, Mauritius, Réunion, Cargados Carajas, Red Sea, Muscat, Gulf of Iran, coasts of India, Ceylon, China, Formosa, Korea, Japan, Philippines, Pelew Islands, Marianas, Marshall Islands, New Ireland, Woodlark Island, Queensland, New South Wales, New Hebrides, New Caledonia, Lord Howe Island, Kingsmill Islands, Fiji, Samoa, Society Islands, Hawaii. In sea.

Note. Günther (1870, l.c.) united *Tetraodon stellatus,* a species without lateral or abdominal bands, with *aerostaticus* (*lineatus* Bl.), a species which such bands, suggesting that these bands gradually disappear with age. Many authors have followed Günther but several recent authors consider the two species as distinct. Stress is laid on the absence of spots on the dorsal in *aerostaticus,* whereas these spots are present in *stellatus.* However, I have seen typical *stellatus* without spots on the dorsal. No large *aerostaticus* are known, what is in accordance with Günther's suggestion, but as Günther remarks, some specimens of moderate size (150 mm) are typical *stellatus.* It is possible that in some individuals the bands disappear sooner than inothers. Günther also united *Tetraodon astrotaenia* with *stellatus.* This species has been described by Bleeker from a single specimen of 26 mm which shows the oblique, dark, abdominal bands of *aerostaticus,* but the upper side is not spotted, the bands being continued on the upper side and radiating from a point on the back before the dorsal. Günther supposes that these bands on the back break up into rows of spots in older specimens. Klunzinger (l.c.) agrees with this supposition, apparently without having seen such small specimens. Annandale & Jenkins (l.c.), however, have examined two small specimens of *astrotaenia,* but they do not feel justified in expressing an opinion as to its distinctness, in the absence of intermediate forms.

8. **Tetraodon reticularis** Bl. Schn.

Tetrodon testudineus Bloch, Ausländ. Fische I, 1785, p. 123 (partim, nec L.).
Tetrodon testudineus Bloch Schneider, Syst. Ichth. 1801, p. 502.
Tetrodon reticularis Bloch Schneider, ibid. p. 506.
Arothron testudinarius Müller, Archiv Naturgesch. IX, 1841, p. 330.
Tetrodon testudineus Cantor, Journ. Asiat. Soc. Bengal XVIII, Part II, 1850, p. 1358 (nec L.).
Tetraodon testudineus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen p. 14. — Nat. Tijdschr. Ned. Indië III, 1852, p. 78 (nec L.).

Crayracion testudineus Bleeker, Atlas Ichth. V, 1865, p. 71 (nec L.).
Tetrodon reticularis Günther, Cat. Brit. Mus. VIII, 1870, p. 296.
Tetrodon reticularis Day, Fishes of India, Part IV, 1878, p. 705.
Tetrodon reticularis Macleay, Proc. Linn. Soc. New S. Wales IX, 1884, p. 61.
Tetrodon reticularis Günther, Fische der Südsee III, 1910, p. 466.
Tetraodon reticularis Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 491.
Tetrodon reticularis Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 470.
Tetraodon reticularis Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 430.
Arothron reticularis Munro, The marine and fresh water fishes of Ceylon, 1955, p. 284.
Arothron reticularis Inger, Fieldiana 36, no. 3, 1957, p. 403.

D. 1. 9 or 2. 8 (9). A. 1. 8-9. P. 1. 15. 2 or 1. 16.

Head 2.6-2.8, 3.4-3.5 in length with caudal. Eye high but not interfering with upper profile of head, above level of mouth, 6.8-8.3, 3.2-3.6 in snout and 3.2-4.2 in flat interorbital space. A pair of solid nasal tentacles, each tentacle without stem and consisting of two lobes, before the eyes. Lateral line inconspicuous. Small spines on head, body, and tail, but surrounding of mouth and caudal peduncle at base of caudal without spines. Dorsal and anal rounded. Longest dorsal rays 2.1-2.3, longest anal rays 2.4-2.9 in head. Base of slightly rounded pectoral slightly less than longest rays which go 2.8-3 in head. Caudal rounded. Least depth of caudal peduncle more than its length, measured from anal, and 1.9-2.3 in head. Colour of preserved specimens brown above, light below. Back, sides of body, tail and brown caudal fin with round, white spots. Belly with longitudinal, sometimes forked, parallel brown stripes, curving upwards on sides of head, encircling the gill opening anteriorly and forming oblique lines on cheeks and snout. A black patch on gill opening and base of pectoral. Dorsal, anal, and pectorals yellowish hyaline. Length 425 mm.

Habitat: Singapore; Sumatra (Siboga, Padang, Benkulen, Palembang!); Nias!; Bintang; Banka; Bankalis; Java (Jakarta!); Bawean; Borneo (Sandakan); Celebes (Makassar, Bonthain, Menado); Flores Sea!; Timor; Buru!; Ambon!; Aru Islands!; New Guinea. — Coasts of India, Ceylon, Andamans, Pinang, Formosa!, China, Philippines, Guam, New Britain, Queensland, Fiji, Thornton Island. In sea and estuaries.

9. **Tetraodon hispidus** L. (Fig. 87, p. 391)

Tetraodon hispidus Linné, Syst. Nat. ed. 10. I, 1758, p. 333.
Tetrodon hispidus Bloch, Ausländ. Fische, I, 1785, p. 130.
Tetraodon perspicillaris Rüppell, Atlas Reise N. Afrika, Fische, 1828, p. 63.

Tetraodon semistriatus Rüppell, Neue Wirbelthiere. Fische des rothen Meeres, 1835, p. 58.
Tetrodon implutus Jenyns, Zool. Voyage Beagle, Fishes, 1842, p. 152.
Tetrodon laterna Richardson, Zool. Voyage Sulphur. Ichthyol. 1844-1845, p. 124.
Tetrodon hispidus Richardson, Voyage Samarang, Zool. Fishes, 1848, p. 17.
Tetrodon bondarus Cantor, Journ. As. Soc. Bengal XVIII, 1950, p. 1359.
Tetraodon hispidus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 23. — Nat. Tijdschr. Ned. Indië III, 1852, p. 299.
Gastrophysus implutus Bleeker, Nat. Tijdschr. Ned. Indië XV, 1858, p. 462.
Crayracion implutus Bleeker, Atlas Ichth. V, 1865, p. 71.
Crayracion laterna Bleeker, ibid. Tab. 205, fig. 3.
Tetrodon laterna Günther, Fishes of Zanzibar, 1866, p. 131.
Tetrodon hispidus Günther, Cat. Brit. Mus. VIII, 1870, p. 297.
Tetrodon bondarus Günther, ibid. p. 298.
Tetrodon hispidus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 641.
Tetrodon hispidus Kossmann & Räuber, Verh. Naturh. — Med. Ver. Heidelberg I, 1876, p. 42.
Tetrodon hispidus Day, Fishes of India, Part IV, 1878, p. 706.
Tetrodon hispidus Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 277.
Tetraodon hispidus Lönnberg, Bih. Svenska Ak. XXII, 1896, No. 1, p. 30.
Tetraodon hispidus Jordan & Evermann, Bull. U.S. Fish. Comm. XXIII (1903) 1905, p. 427.
Tetraodon hispidus Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 369.
Tetrodon hispidus Günther, Fische der Südsee III, 1910, p. 466.
Tetrodon hispidus Bamber, Journ. Linn. Soc. Zool. XXXI, 1915, p. 485.
Tetraodon hispidus McCulloch, Austr. Zool. II, Part III, 1922, p. 128.
Tetraodon hispidus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 492.
Tetraodon hispidus E. K. Jordan, Proc. U.S. Nat. Mus. 16, Art. 33, 1925, p. 42.
Tetrodon hispidus Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 975.
Tetraodon hispidus Whitley, Rec. Austr. Mus. XVI, 1927, p. 31.
Tetrodon hispidus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 470
Ovoides implutus Whitley, Great Barrier Reef Exp. British Mus. Sci. Rep. IV, No. 9, 1932, p. 311.
Tetraodon hispidus Fowler, Proc. Acad. Nat. Sci. Philadelphia 86, 1934, p. 511. — Monogr. Acad. Nat. Sci. Philadelphia 2, 1938, p. 178, p. 186, p. 208, p. 215.
Arothron hispidus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 420.
Arothron hispidus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 283.
Arothron hispidus Randall, Atoll Res. Bull. 47, 1955, p. 234.

D. 1. 9. A. 1. 9. P. 1. 16.

Head 2.7, 3.5 in length with caudal. Eye high, interfering with upper profile of head, above level of mouth, 3.4 in snout and 3 in concave interorbital space. A pair of solid nasal tentacles of a short stem and two lobes, before eyes. A single lateral line, bent downwards below dorsal fin, not conspicuous on caudal peduncle. Small spines on cheeks, postorbital part of head, back to dorsal fin, belly, where they are larger than in the area before anal fin. Anterior part of head, tail, and caudal peduncle without spines. Dorsal and anal rounded, the longest rays 2.6 in head. Base of slightly rounded pectoral almost equal to the length of the longest rays which go 3.1 in head. Caudal truncate. Least depth of caudal peduncle less than its length, measured from anal, and 2.9 in head. Colour of preserved specimens brown above, light below. Head, back and sides, tail, caudal peduncle and the brown caudal fin with white dots, smaller and more crowded on posterior part of caudal peduncle and on caudal. Lower parts of head and sides with faint, longitudinal brown stripes. Base of pectoral and gill opening in a large, dark brown patch; a narrow white line forms a hemicircle in front of this patch, and behind the base of the pectoral are two concentric similar bands. Dorsal and pectorals light brown, dark brown basally. Anal light brown. Length 534 mm.

Habitat: Sumatra (Siboga, Padang, Benkulen); Celebes (de Bril near Makassar!, Makassar, Menado); Solor; Timor; Batjan; Ambon!; Aru Islands; Waigeu!; New Guinea (Manokwari, Port Moresby). — Coast of S. Africa as far south as Knysna, Mozambique!, Zanzibar, Madagascar, Réunion, Mauritius, Seychelles, Red Sea, Muscat, Aden, coasts of India, Ceylon, Cocos Keeling Islands, Pulu Condor, China, Formosa, Riu Kiu Islands, Japan, Penang, Philippines, Guam, Marshall Islands, Kusaie, Admirality Islands, Duke of York Island, New Britain, New Hannover, Woodlark Island, Santa Cruz Islands, New Hebrides, New Caledonia, Lord Howe Island, Queensland, New South Wales?, West Australia, Kingsmill Islands, Ellice Islands, Fiji, Samoa, Tonga Islands, Cook Islands, Society Islands, Tuamotu Islands, Christmas Island, Fanning Islands, Palmyra Island, Hawaii.

Note. Whitley doubts if the name *Tetraodon hispidus* Linné can be applied to the species generally so called. This doubt apparently arises from what Lönnberg, who examined Linné's type, says (l.c.): "This type of *T. hispidus* is probably the same species as *T. hispidus* of later authors but it cannot be proved for certain without comparision with other types. The spines of the belly are rather long and like bristles. The specimen is discolored".

10. **Tetraodon mappa** Lesson

Tetraodon mappa Lesson, Voyage Coquille, Zool. 1830, p. 102.

Tetraodon reticulatus Bleeker, Verh. Bat. Gen. XXII (1848) 1849. Bijdr. kennis ichth. fauna Madura, p. 16.
Tetraodon calamaroides Bleeker, Nat. Tijdschr. Ned. Indië I, 1850, p. 96. — Verh. Bat. Gen. XXIV. 1852. Bijdr. kennis blootk. visschen, p. 16.
Tetraodon reticulatus Bleeker, ibid. p. 18.
Tetraodon meleagris Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 91 (nec Lac.).
Crayracion mappa Bleeker, Atlas Ichth. V, 1865, p. 72.
Crayracion meleagris Bleeker, l.c. (nec Lac.).
Tetrodon mappa Günther, Cat. Brit. Mus. VIII, 1870, p. 293.
Tetrodon mappa Steindachner, Abh. Senckenb. naturf. Ges. XXV, 1901, p. 463.
Tetrodon mappa Günther, Fische der Südsee III, 1910, p. 464.
Tetraodon mappa Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 494.
Tetrodon mappa Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 469.
Cyprichthys mappa Whitley, Mem. Queensland Mus. XI, 1936, p. 51.

D. 1.10-1.11. A. 1.9-1.11. P. 1.16-1.17.

Head 2.94, 3.52 in length with caudal. Eye high but not interfering with upper profile of head, 7.1, 3.4 in snout and 2.85 in scarcely convex interorbital space. A rather small, bifid, solid nasal tentacle before each eye. Lateral line inconspicuous. Head, body, and tail covered with small spines, with the exception of snout, chin, surroundings of eye, and caudal peduncle. Dorsal and anal rounded, longest dorsal rays 2.5, longest anal rays 2.9 in head. Pectorals rounded, the longest rays 3.1 in head and longer than the base of the fin. Caudal slightly rounded. Least depth of caudal peduncle 1.3 in its length, measured from anal. Colour of preserved specimens brown above, lighter below, in young and semi-adults the whole head, body, and tail are (often?) covered with a dark network, including the caudal fin, the lines forming the reticulations on the head radiating from eye. In adults these reticulations are broken up into branching lines, a dark network formed by broad lines conspicuous below pectoral. Anus in a dark blotch. Length 535 mm.

Habitat: Singapore; Batu Islands; Java (Jakarta, Surabaya); Madura; Flores; Solor; Sulu Islands; Ternate; Buru; Ceram; Ambon; New Guinea (Manokwari, Port Moresby). — Zanzibar, Siam, Philippines, Pelew Islands, Australia (Lindeman Island), Gilbert Islands, Samoa, Society Islands.

11. **Tetraodon immaculatus** Bl. Schn.

Tetrodon immaculatus Bloch Schneider, Syst. Ichth. 1801, p. 507.
Tetrodon manillensis Procé, Bull. philom. 1822, p. 130.
Tetraodon sordidus Rüppell, Atlas Reise N. Afrika, 1828, p. 64. — Neue Wirbelth. Fische des rothen Meeres, 1835, p. 60.
Tetraodon scaber Eydoux & Souleyet, Voyage Bonite, Zool. I, 2, 1841, p. 214.

Tetrodon virgatus Richardson, Voyage Erebus & Terror, Fishes, 1846, p. 62.

Tetrodon immaculatus Cantor, Journ. Asiat. Soc. Bengal XVIII, Part 2 (1849) 1850, p. 1355.

Tetraodon Kunhardtii Bleeker, Nat. Tijdschr. Ned. Indië I, 1850, p. 97. — Ibid. III, 1852, p. 79. — Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 17, p. 23.

Tetraodon aspilos Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 495. — Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 22.

Tetraodon virgatus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdra. kennis blootk. visschen, p. 24. — Nat. Tijdschr. Ned. Indië III, 1852, p. 299.

Arothron virgatus Bleeker, Verh. Akad. Amsterdam II, 1855. Over eenige visschen van van Diemensland, p. 16.

Arothron scaber Bleeker, Nat. Tijdschr. Ned. Indië IX, 1855, p. 112. — Ibid. XII, 1856, p. 218.

Crayracion manillensis Bleeker, Atlas Ichth. V, 1865, p. 69.

Crayracion immaculatus Bleeker, ibid. p. 75.

Crayracion immaculatus Kner, Novara Exp. Fische, 1865-1867, p. 408.

Tetrodon immaculatus Günther, Cat. Brit. Mus. VIII, 1870, p. 291.

Tetrodon immaculatus Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 642.

Tetrodon immaculatus Day, Fishes of India, Part IV, 1878, p. 703.

Tetrodon virgatus Macleay, Proc. Linn. Soc. New S. Wales II, 1878, p. 365. — Descr. Cat. Austr. Fish. II, 1881, p. 275.

Tetrodon immaculatus Vinciguerra, Ann. Museo Civ. Storia Nat. Genova (2), IX, 1890, p. 359.

Tetrodon immaculatus Seale, Occas. Papers B. P. Bishop Mus. I, No. 3, 1900, p. 119.

Tetraodon immaculatus Fowler, Proc. Acad. Nat. Sci. Philadelphia LV, 1903, p. 165.

Tetraodon immaculatus Evermann & Seale, Proc. U.S. Nat. Mus. XXXI, 1906, p. 510.

Tetraodon immaculatus Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 370. — Ibid. XXVI (1906) 1907, p. 37.

Tetraodon immaculatus Jordan & Richardson, ibid. XXVII (1907) 1908, p. 273.

Tetrodon immaculatus Günther, Fische der Südsee III, 1910, p. 464.

Tetraodon manillensis Kendall & Goldsborough, Mem. Mus. Comp. Zool. XXVI, No. 7, 1911, p. 335.

Tetraodon immaculatus, var. *manillensis* McCulloch, Austr. Zoologist II, Part III, 1922, p. 128.

Tetraodon immaculatus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 489.

Tetrodon immaculatus var. *virgata* Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 974.

Tetrodon immaculatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 469.

Tetrodon immaculatus Pietschmann, Bull. B. P. Bishop Mus. 73, 1930, p. 22.

Ovoides manillensis Whitley, Great Barrier Reef Exp. British Mus. Sci. Rep. IV, No. 9, 1932, p. 312.

Ovoides manillensis virgatus Whitley, Rec. South Austr. Mus. V, No. 3, 1935, p. 355.

Tetraodon immaculatus Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 429.

Tetrodon immaculatus Fowler, Proc. Acad. Nat. Sci. Philadelphia LXXXIX, 1937, p. 264.

Tetraodon immaculatus Herre, Ann. Zool. Jap. 18, 1939, p. 307. — Rec. Indian Mus. XLI, 1939, p. 372.

Arothron immaculatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impres. 1950, p. 420.

Arothron immaculatus Randall, Atoll Res. Bull. 47, 1955, p. 234.

Arothron immaculatus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 282.

Arothron immaculatus Inger, Fieldiana 36, no. 3, 1957, p. 403.

D. 2.7-2.9. A. 2.7-2.8. P. 1.15-2.16.

Head 2.7-3, 3.6-4 in length with caudal. Eye above level of mouth, not interfering with upper profile of head 4.1-6, 1.75-2.5 in snout and 1.75-2.3 in almost flat interorbital space. Nasal organs before eye, each consisting of two tentacles, joined at the base. Lateral line inconspicuous. Head, body, and tail covered with long, slender spines, but surroundings of eye, chin, surroundings of anus and anal, and caudal peduncle behind anal, naked. Dorsal and anal rounded or slightly pointed, the second or third forked rays longest and 2.3-3 in head. Origin of anal behind that of dorsal. Pectorals rounded, the longest rays longer than the base of the fin and 2.8-3 in head. Caudal slightly rounded. Least depth of caudal peduncle 1-1.2 in its length, measured from anal. Caudal peduncle moderately compressed. Colour of preserved specimens dark above, light below, with or without dark longitudinal lines on back, sides of head, body, belly, and tail, those on sides forming loops before gill opening. Caudal blackish terminally and along upper and lower border. A dark blotch between gill opening and base of pectoral, not always distinct. Length 305 mm.

Nomen indig.: Buntel pasir.

Habitat: Singapore; Sumatra (Benkulen, Trussan, Priaman, Siboga); Batu Islands; Nias; Mentawi Islands; Java (Jakarta, Bantam); Borneo (Sandakan); Celebes (Makassar!, Badjoa); Sulu Islands!; Flores Sea!; Ternate; Batjan; Buru; Ceram; Ambon!; Kei Islands!; Aru Islands!; Waigeu!; New Guinea (Sorong! Humboldt Bay!, Papua). — Coasts of E. Africa as far south as Port Alfred, Zanzibar, Madagascar, Comores, Seychelles, Mauritius, Réunion, Red Sea, Aden, coasts of India, Nicobars, Andamans, Burma, Siam, Malay Peninsula, China, Philippines, Pelew Islands, Marshall Islands, New Britain, New Ireland, Guam, Solomon Islands, Thursday Island, Australia, New Hebrides, New Caledonia, Kingsmill Islands, Funafuti, Fiji, Samoa, Tonga Islands, Tongatabu.

Note. Günther (1870, l.c.) united *T. immaculatus* (without bands) with *manillensis* = *virgatus* (with dark longitudinal bands). Most authors followed Günther but the supposition of Jordan & Seale (l.c.) that the striped specimens are young stages of the uniform *immaculatus* has been doubted by several authors. Bleeker's specimens of *manillensis* measure 55-220 mm and those of *immaculatus* 60-270 mm. Herre (1924, l.c.) who examined preserved as well as living specimens, says that: "these color phases often seem to have no relation to size or maturity, though the striped form is probably usually immature".

12. **Tetraodon nigropunctatus** Bl. Schn.

Tetrodon nigro-punctatus Bloch Schneider, Syst. Ichth. 1801, p. 507.
Tetraodon diadematus Rüppell, Atlas Reise N. Afrika, 1828, p. 65.
Tetraodon trichoderma Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 532.
Tetraodon trichodermatoides Bleeker, ibid. VI, 1854, p. 336.
Arothron melanorhynchos Bleeker, ibid. IX, 1855, p. 111.
Arothron trichoderma Bleeker, ibid. XII, 1856, p. 218.
Crayracion nigropunctatus Bleeker, Atlas Ichth. V, 1865, p. 74.
Tetrodon nigropunctatus Günther, Cat. Brit. Mus. VIII, 1870, p. 293.
Tetrodon nigropunctatus var. *citrinella* Günther, l.c.
Tetrodon nigropunctatus? Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 643.
Tetrodon nigropunctatus Day, Fishes of India, Part IV, 1878, p. 704.
Tetrodon aurantius Ogilby, Rec. Austr. Mus. I, 1890, p. 81, p. 101.
Tetrodon nigropunctatus Waite, Mem. Austr. Mus. III, 1899, p. 197.
Tetrodon nigropunctatus Steindachner, Abh. Senckenb. naturf. Ges. XXV, 1901. p. 462.
Tetraodon nigropunctatus Jordan & Seale, Bull. Bur. Fish. XXV (1905) 1906, p. 369.
Tetraodon nigropunctatus Evermann & Seale, ibid. XXVI (1906) 1907, p. 101.
Tetrodon nigropunctatus Günther, Fische der Südsee III, 1910, p. 468.
Tetraodon nigropunctatus var. *citrinellus* McCulloch, Austr. Zool. II, Part III, 1922, p. 129.
Tetraodon nigropunctatus Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 496.
Tetrodon nigropunctatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 471.
Tetrodon nigropunctatus Pietschmann, Bull. B. P. Bishop Mus. 73, 1930, p. 23.
Tetrodon nigropunctatus Fowler, Mon. Acad. Nat. Sci. Philadelphia 2, 1938, p. 186, p. 208.
Arothron nigropunctatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 420.
Arothron nigropunctatus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 283.
Arothron nigropunctatus Randall, Atoll Res. Bull. 47, 1955, p. 236.
Arothron nigropunctatus Inger. Fieldiana 36, no. 3, 1957, p. 403.

D. 1. 9 A. 1. 10. P. 2. 15.

Head 3, 3.7 in length with caudal. Eye high but not interfering with upper profile of head, its inferior border not much above level of corner of mouth, 4.7, 2.1 in snout and 2.1 in almost flat interorbital space. Each nasal organ consisting of two tentacles on a short stem. Sensory canal surrounding eye in a wide circle, running as upper lateral line along back, bent downwards before dorsal and getting inconspicuous on tail. Head, body, and tail with rather long, slender, white spines which often appear as white points on the dark skin, not present on surroundings of mouth and posterior part of caudal peduncle, often retracted on parts of the body and giving appearance of the fish being naked in parts. Dorsal and anal rounded, the median rays longest and 5.1 in head. Origin of anal far behind dorsal. Pectorals fan-like, 6.1 in head. Caudal rounded. Caudal peduncle compressed, its least depth 1.1 in its length, measured from anal. Colour of preserved specimens brown, anterior part of interorbital space, surroundings of mouth and posterior part of caudal peduncle, white. Small round black spots scattered on sides of head, body, and tail. Anus in a black blotch. Nasal tentacles dark brown. Dorsal and anal light brown, caudal whitish, the rays light brown. Sides of head, body and tail are yellow in some specimens and in the variety *citrinella* the whole fish is light yellow, but the scattered black spots apparently are always present. Length 250 mm.

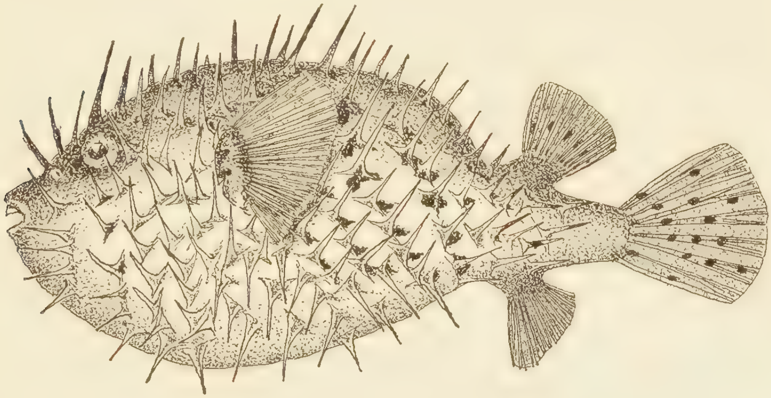

Fig. 88. *Diodon hystrix* L. × ½.

Habitat: Sumatra (Priaman); Nias; Batu Islands; Borneo (Pulo Bakkungaan Kechil); Celebes (Menado); Sulu Islands; Saleyer!; Flores Sea!; Rotti!; Timor; Halmahera; Morotai; Ternate; Ambon!; Misol; Arafura Sea; Waigeu; New Guinea (Manokwari, Papua). — Delagoa Bay, Madagascar, Seychelles, Mauritius, Red Sea, coasts of India, Ceylon, Andamans, Japan, Philippines, Pelew Islands, Guam, Mortlock Island, Ruk Island, New Ireland, Solomon Islands, Australia, Marshall Islands, Gilbert Islands, Funafuti, Fiji, Samoa, Cook Islands, Society Islands, Thorton Island, Fanning Island, Chritsmas Island, Jarvis Island, Hawaii. In sea.

8. Family DIODONTIDAE

Body inflatable, covered by strong two- or three-rooted spines. Nostrils separate, in a tubular papilla or confluent, each nasal organ appearing as a bifid tentacle. Teeth coalesced, forming a beak with the jaws, the upper and lower beak without outer median suture, but on the inner, inferior side of the upper and on the superior side of the lower beak there are masticatory plates, formed by coalesced teeth and showing transverse, parallel sutures as well as a median suture. No spinous dorsal. No ventrals Dorsal and anal short, posterior. Pectorals more or less fan-like. Caudal present.

Distribution: All warm seas.

Key to the Indo-Australian genera of Diodontidae

A. Most spines two-rooted, erectile . . . . . . 1. *Diodon* p. 410.
B. All spines three-rooted, immovable. . . . . . 2. *Chilomycterus* p. 413.

1. **Diodon** Linnée

(Linné, Syst. Naturae, ed. X, 1758, p. 334)
Paradiodon Bleeker, Atlas Ichth. V, 1865, p. 56.

Jaws without median suture. Body covered with dermal spines, most of which are movable and two-rooted. Nostrils separate, in a tubular papilla.

Distribution: All warm seas.

Key to the Indo-Australian species of Diodon

A. Large dark blotches or bands, bordered by yellowish, on sides of head and back. Fins uniform yellowish . . . . 1. *D. holacanthus* p. 410.
B. No large blotches or bands. Head, body, tail, and fins, except anal, with dark spots . . . 2. *D. hystrix* p. 412.

1. **Diodon holacanthus** L

Diodon holacanthus Linné, Syst. Nat. ed. 10. 1758, p. 335.
Diodon spinosissimus Cuvier, Mem. Mus. Hist. Nat. IV, 1818, p. 134.
Diodon novemmaculatus Cuvier, l.c.
Diodon sexmaculatus Cuvier, ibid, p. 136.
Diodon quadrimaculatus Cuvier, ibid. p. 137.

Diodon novemmaculatus Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 567.
Diodon quadrimaculatus Bleeker, Acta Soc. Sci. Indo-Neerl. II, 1857, Achtste bijdr. kennis vischfauna Amboina, p. 94.
Paradiodon novemmaculatus Bleeker, Atlas Ichth. V, 1865, p. 57.
Paradiodon quadrimaculatus Bleeker, ibid. p. 58.
Paradiodon quadrimaculatus Kner, Novara Exp. Fische, 1865-1867, p. 406.
Diodon spinosissimus Günther, Cat. Brit. Mus. VIII, 1870, p. 307.
Diodon maculatus Günther, l.c.
Diodon maculatus Klunzinger, Sitzber. Akad. Wien LXXX. 1. Abt. (1879) 1880, p. 424.
Diodon maculatus Day, Fishes of India. Suppl. 1888, p. 809.
Diodon holacanthus Jordan & Snyder, Proc. U.S. Nat. Mus. XXIV, 1901, p. 257.
Diodon maculatus Steindachner, Denkschr. Akad. Wien LXXI, 1902, p. 160.
Diodon holacanthus Snyder, Bull. U. S. Fish. Comm. XXII (1902) 1904, p. 535.
Diodon holacanthus Jordan & Evermann, ibid. XXIII (1903), Part 1, 1905, p. 436.
Diodon maculatus Günther, Fische der Südsee III, 1910, p. 475.
Diodon bleekeri Günther, l.c.
Diodon bleekeri Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 506.
Diodon holocanthus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 473.
Diodon holacanthus P. J. Schmidt, Trans. Pacific Comm. Acad. Sci. USSR 1, 1930, p. 110.
Diodon holacanthus Tortonese, Boll. Mus. Zool. Anat. Comp. Univ. Torino XLV, 1935-1936, Ser. III. N. 63, p. 63.
Diodon holacanthus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 415.
Diodon maculifer Munro, The marine and fresh water fishes of Ceylon, 1955, p. 278 (nec Kaup?).
Diodon holacanthus Inger, Fieldiana 36, no. 3, 1957, p. 404.

D. 3. 11. A. 3. 11. P. 1. 22.

Head 2.6, 3.1 in length with caudal. Eye 3.1, 1.16 in snout and 1.6 in the least width of the flat interorbital space. Nasal organ a compressed tube in front of and close to eye with an anterior and a posterior opening. Spines movable, generally two-rooted, but spines of posterior part of back and posterior part of sides three-rooted. A median spine between nasal tubes. A small spine ,directed downwards, below front border of eye. About 5 spines above eye. Median part of interorbital space without spines. All spines shorter than eye, except a few behind base of pectorals which are as long as eye. Anterior part of caudal peduncle with a few spines, otherwise naked. Snout without spines. About 17 rows of spines from snout to base of dorsal. A small fleshy tentacle above eye and two minute ones on throat. The inner masticatory surface flat, with a median longitudinal groove and parallel transverse grooves. Dorsal rounded, the longest rays 2.27 in head. Origin of anal below end of dorsal, the fin rounded, the longest rays 2.77 in head. Pectorals fan-like, the upper rays longest and 2.27 in head. Caudal rounded. Least depth of caudal peduncle 2.25 in its length, measured from anal. Colour of preserved specimens brown above, whitish below. A large, dark patch on cheeks below eye, a broad, dark postocular transverse band, continued on sides of head, but interrupted behind eye, bordered anteriorly and posteriorly by a yellow stripe. A dark, oval patch, larger than eye, encircled by yellow, above each pectoral. A similar but larger median patch on back before dorsal, the base of which is situated in a similar, but smaller patch. Base of most spines of sides in a large, dark, rounded spot. Fins yellowish, unspotted. Length 500 mm.

Habitat: Singapore; Sumatra (Priaman); Batu Islands; Nias; Java, Borneo (Pulo Bakkungaan Kechil); Celebes (Badjoa, Menado); Buru; Ternate; Ambon!; Saparua; Flores!; Solor; Timor; Kei Islands; Mysore Islands; New Guinea (Manokwari, Madang). — In al warms seas.

2. **Diodon hystrix** L (Fig. 88, p. 409)

Diodon hystrix Linné, Syst. Naturae, ed. X, 1758, p. 335.
Diodon atinga Bloch, Ausländ. Fische I, 1785, p. 67 (nec L.).
Diodon hystrix Bloch, ibid. p. 69.
Diodon punctatus Cuvier, Mém. Mus. Hist. Nat. IV, 1818, p. 132.
Diodon punctatus Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis blootk. visschen, p. 19.
Diodon atinga Bleeker, Acta Soc. Sci. Indo-Neerl. VIII, 1860. Achtste bijdr. kennis vischfauna Sumatra, p. 66.
Diodon atringa Bleeker, Ned. Tijdschr. Dierk. I, 1863, p. 229.
Paradiodon hystrix Bleeker, Atlas Ichth. V, 1865, p. 56.
Diodon hystrix Günther, Cat. Brit. Mus. VIII, 1870, p. 306.
Diodon hystrix Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 647.
Diodon hystrix Day, Fishes of India, Part IV, 1878, p. 708.
Diodon hystrix Macleay, Descr. Cat. Austr. Fish. II, 1881, p. 279.
Diodon hystrix Seale, Occas. Papers B. P. Bishop Mus. I, No. 3, 1901, p. 120.
Diodon hystrix Jordan & Evermann, Bull. U.S. Fish. Comm. XXIII (1903) 1905, p. 437.
Diodon hystrix Günther, Fische der Südsee III, 1910, p. 474.
Diodon hystrix Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 504.
Diodon hystrix Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 980.
Diodon hystrix Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 472.
Diodon hystrix P. J. Schmidt, Trans. Pacif. Comm. Acad. Sci. USSR I, 1930, p. 110.
Diodon hystrix Chevey, Trav. Int. Océanogr. Indochine, 4. Mém. 1932, p. 121.
Diodon hystrix Fowler, Proc. Acad. Nat. Sci. Philadelphia 86, 1934, p. 511.
Diodon hystrix Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 432.
Diodon hystrix J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 415.

D. 2. 12-2.13. A. 2.13-3.12. P. 1.21-1.22.

Head 2.58-2.72, 3.12-3.24 in length with caudal. Eye 6.4-6.8, 2.36-2.75 in snout and 3.8-4.18 in the least width of the slightly concave interorbital space. Most spines movable, generally two-rooted, but some spines of posterior part of back and some of those on the sides three-rooted. No spines on snout. Seven or eight spines on anterior transverse rows of interorbital space, most of them longer than eye. Twelve spines in line connecting base of pectorals over back. Fifteen or sixteen spines in a line from below eye to below dorsal. Tail naked, except a few immovable spines on its upper and lower side. Origin of anal below posterior part of dorsal. Longest dorsal rays 2.26-2.3, longest anal rays 2.3-2.75 in head. Longest pectoral rays 2-2.33 in head. Caudal rounded. Colour of preserved specimens brown, lighter below. A dark spot at base of most spines. A very large specimen is spotted all over, independent of the spines. Caudal dorsal, and pectorals dark spotted. Anal light, uniform. Length 900 mm.

Nomen indig. Buntel duren.

Habitat: Singapore; Batu Islands; Sumatra (Telokbetong); Java (Jakarta); Celebes (Makassar, Menado); Flores!; Timor; Ternate; Ambon; Ceram; Banda; New Guinea (Hood Bay) — All warm seas.

2. **Chilomycterus** Bibron

(Bibron, Revue Zool. 1846, p. 140)

Cyanichthys Kaup, Wiegmann's Arch. XXI, 1855, p. 231.
Cyclichthys Kaup, l.c.
Diodon Bleeker, Atlas Ichth. V, 1865, p. 54 (nec L.)

Jaws without median suture. Body covered with dermal spines, all of which are three-rooted. Spines immovable. Nostrils separate, in a tubular papilla.

Distribution: Tropical and subtropical parts of Atlantic, Indic, and Pacific.

Key to the Indo-Australian species of Chilomycterus

A. Nasal organs on interorbital space. A median spine on interorbital space . . . . 1. *C. orbicularis* p. 414.
B. Nasal organs before eye. Interorbital space without spines.
  a. D. 11. A. 11. Colour uniform . . . . 2. *C. hardenbergi* p. 415.
  b. D. 13. A. 13. Upper parts spotted . . . . . . 3. *C. tigrinus* p. 416.

1. **Chilomycterus orbicularis** (Bl.)

Diodon orbicularis Bloch, Ausländ. Fische I, 1785, p. 73.
Diodon caeruleus Quoy & Gaimard, Voyage Uranie & Physicienne, Zool. 1824, p. 201.
Diodon triedricus Cantor, Journ. Asiat. Soc. Bengal XVIII, Part II (1849) 1850, p. 1353.
Diodon orbicularis Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 92.
Cyclichthys orbicularis Bleeker, Acta Soc. Sci. Indo-Neerl. VIII, 1860. Dertiende Bijdr. kennis vischfauna Celebes, p. 12.
Diodon orbicularis Bleeker, Atlas Ichth. V, 1865, p. 55.
Chilomycterus orbicularis Günther, Cat. Brit. Mus. VIII, 1870, p. 312.
Chilomycterus orbicularis Bleeker, Ned. Tijdschr. Dierk. IV (1871) 1872, p. 121.
Chilomycterus orbicularis Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 508.
Diodon orbicularis Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 982.
Chilomycterus orbicularis Fowler, Hongkong Naturalist 6. Suppl. 1938, p. 51.
Chilomycterus orbicularis Blegvad, Danish Invest. Iran. Part III, 1944, p. 220.
Cyclichthys orbicularis J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 416.

D. 1. 9 (10). A. 1. 9. P. 1. 18 (19).

Head 2.4, 2.8 in length with caudal. Eye 4.15, 1.38 in snout and 1.38 in concave interorbital space. Nasal organ a compressed tube on interorbital space, closed above and with an anterior and a posterior opening. All spines with three roots, the roots rather slender. Spines short. A median spine on interorbital space. Three spines above each eye, forming a supraorbital ridge. A small spine, directed outwards, between eye and corner of mouth. The row of spines above eye is followed by a row of six spines, the second above gill opening, the first midway between the last supraorbital spine and the second postorbital one, the sixth spine below origin of dorsal. Chin without spines. Jaws feeble, the upper obtusely pointed. The inner masticatory surface concave and slightly grooved longitudinally. Dorsal rounded, the longest rays 1.6 in head. Origin of anal below end of dorsal, the fin rounded, the longest rays 2.25 in head. Pectorals fan-like, the upper rays longest and 1.46 in head. Caudal rounded. Least depth of caudal peduncle 2.75 in its length, measured from anal. Caudal peduncle without spines. Colour of preserved specimens brown, lighter below. Black blotches at the base of the spines on the sides. Length 265 mm.

Habitat: Celebes (Badjoa, Gorontalo); Solor; Ceram; Ambon!; north of New Guinea. — Cape of Good Hope, west coast of Africa, Réunion, Muscat, Persian Gulf, Bay of Bengal, coasts of Malay Peninsula, China, Philippines. In sea.

2. **Chilomycterus hardenbergi** de Bfrt (Fig. 89, p. 415)

Chilomycterus hardenbergi de Beaufort, Treubia 17, afl. 1, 1939, p. 33.
Chilomycterus hardenbergi Fowler, Mem. B. P. Bishop Mus. XII, 2, 1949, p. 158.

D. I. 10. A. I. 10. P. I. 17. I.

Head 2.5, 3.27 in length with caudal. Eye without free orbital margin, 4.25, 1.58 in snout and 2.8 in flat interorbital space. Nasal organ in front of eye, best described as a compressed tube, open at its end and with a round perforation anteriorly at its base. Spines short but strong, three-rooted, the roots broad, flat and ridged. Two small spines before nostrils. Two spines above eye, followed by six spines, the second above base of pectorals, the first midway between second supraorbital spine and second postorbital spine, the sixth below dorsal. Six spines between interorbital space and origin of dorsal. Snout, chin, and interorbital space without spines. Cheeks without spines, except two minute ones below eye. Caudal peduncle naked. Lips rather thick, papillated. Cutting edge of upper jaw feebly scalloped, obtusely pointed medianly. The inner masticatory surface slightly convex longitudinally, with a median and two transverse grooves. Dorsal rounded, the longest rays 1.8 in head. Anal rounded, the longest rays twice in head. Origin of anal below end of dorsal. Caudal long, rounded, its base narrow, the longest rays 1.16 in head. Least depth of caudal peduncle 2.1 in its length, measured from anal. Colour of preserved specimen dark crimson on back, light crimson on sides and still lighter on underside. Fins uniform light crimson. Length of single specimen known 172 mm.

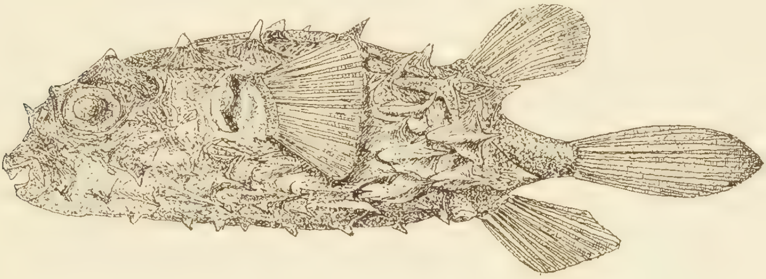

Fig. 89. *Chilomycterus hardenbergi* de Bfrt.

Habitat: New Guinea (Merauke!).

Note. This species differs from *C. affinis* in having less rays in the fins and less spines on the back. Besides the caudal fin is much longer and there are no traces of spots, either on the body or on the fins.

3. **Chilomycterus tigrinus** (Cuv.)

Diodon tigrinus Cuvier, Mem. Mus. Hist. Nat. 1818, p. 127.
Chilomycterus reticulatus Bribron, Rev. Zool. 1846, p. 142 (nec L.).
Cyanichthys caeruleus Kaup, Wiegmanns Arch. XXI, 1855, p. 231 (nec Q. & G.).
Diodon coeruleus Bleeker, Atlas Ichth. V, 1865, p. 55 (nec Q. & G.).
Chilomycterus tigrinus Günther, Cat. Brit. Mus. VIII, 1870, p. 314.

D. 13. A. 13. P. 21.

Spines short, slightly compressed, with the roots of moderate length. Forehead concave, without spine. Three supraorbital spines, the anterior of which is rather strong, emitting its inner root across the frontal bone. Nostrils in front of the orbit. Two osseous stripes across the back of the tail, behind the dorsal fin, the posterior with the spine in the median line; abdominal ossifications as much developed as those on the back; there are eight in a longitudinal series nearest to the median line of the back. All the upper parts with small round blackish spots. A few small black spots on the side of the abdomen. Fins colourless. (After Günther, not seen by me).

Habitat: Indian Archipelago?; New Guinea?. — Réunion.

Note. Bleeker (Atlas Ichth. V, 1865, p. 54) thought that *C. reticulatus* Bibron is the same as *Dicotylichthys punctulatus* Kaup and hence gave as description of Bibron's species that of Kaup's *D. punctulatus*. I have not seen specimens of *C. tigrinus*; the synonymy given above is that of Günther.

Bibron's specimen is said to be from the Indian Archipelago. About Kaup's specimen Günther (l.c.) says: "Dr. Kaup states that the specimen examined by him is from New Guinea; but the source whence the example was obtained was never known at the British Museum. He has evidently transferred Gaimard's statement ,which refers to another species, to this individual".

9. Family MOLIDAE

Body not inflatable, covered by minute granulations or by smooth hexagonal plates. Teeth coalesced, forming a beak with the jaws, which have no median suture. No spinous dorsal. No ventrals. Soft dorsal and anal much longer than broad, more or less pointed, situated opposite each other at the end of the body, which is abruptly truncated in adults, as if the tail were amputated. The posterior parts of dorsal and anal extend round the rear end of the truncated body, the rays being abruptly branched at their distal ends and supporting a broad, stiff lobe which acts as a rudder (clavus). All species pass through a metamorphosis. The larvae develop a cuirass of broad plates with triangular projections (*Ostracion boops* stage); they have a larval tail and caudal fin, remains of which are only found in the genus *Masturus*. The cuirass remains in a reduced form in the genus *Ranzania*, but in the other genera the cuirass breaks up into small denticles and the triangular projections grow into long spines, which gradually disappear (*Molacanthus* stage), except in *Mola*, where the base of a spine on the snout and one on the chin nearly always remain.

Distribution. Pelagic fishes of all oceans.

Key to the genera of Molidae

A. Comparatively elongate. Carapace of smooth hexagonal plates. Mouth vertical, lips produced. Clavus with 22 rays . . . . 1. *Ranzania*, p. 417.
B. Form shorter. Skin of body and clavus with small rough denticles. Lips not funnel-like.
  a. Median rays of clavus produced, supporting a pronounced lobe. Clavus with 18-22 rays. . . 2. *Masturus*, p. 419
  b. Median rays of clavus not produced, hindmargin of clavus rounded, lobed in adults. Clavus with 12-16 rays . . . . 3. *Mola*, p. 421

1. **Ranzania** Nardo

(Nardo, Ann. Sci. Regno Lombardo-Veneto 5, 1839, p. 10, p. 105)
?*Triurus* Lacepède, Hist. Nat. Poissons II, 1800, p. 200.

Rather elongate. Body covered with smooth hexagonal plates, not covering vertical fins or clavus. Lips produced forward beyond teeth as a funnel, closing as a vertical slit. Clavus with 22 rays.

A single species known.

1. **Ranzania laevis** (Pennant) (Fig. 90, p. 418)

Ostracion laevis Pennant, Brit. Zool. ed. 4. III, 1776, p. 129.
Tetrodon truncatus Retzius, K. Svenska Vetensk. Handl. 6, 1798, p. 121.
Orthragoriscus oblongus Bloch Schneider, Syst. Ichth. 1801, p. 511.
Ranzania typus Nardo, Ann. Sci. Regno Lombardo-Veneto 5, 1839, p. 105.
Orthagoriscus truncatus Günther, Cat. Brit. Mus. VIII, 1870, p. 319.
Ranzania makua Jenkins, Proc. Calif. Acad. V, 1895, p. 780.
Ranzania makua Fowler, Proc. Acad. Nat. Sci. Philadelphia, 1900, p.514.
Ranzania makua Jordan & Snyder, Proc. U.S. Nat. Mus. XXIV, 1901, p. 262.
Ranzania makua Jordan & Evermann, Bull. U.S. Fish. Comm. XXIII (1903) 1905, p. 440.
Ranzania truncata Günther, Fische der Südsee III, 1910, p. 477.

Ranzania makua Herre, Philipp. Journ. Sci. 25, No. 4, 1924, p. 509.
Ranzania truncata Barnard, Ann. S. Afr. Mus. XXI, Part 2, p. 989.
Triurus laevis Whitley, Mem. Queensl. Mus. XI, 1937, p. 147.
Ranzania laevis Deraniyagala, Journ. Bombay Nat. Hist. Soc. XLIV, No. 3, 1944, p. 429.
Triurus truncatus Fowler, Mem. B. P. Bishop Mus. XII, 2. 1949, p. 158.
Ranzania typus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 422.
Ranzania laevis Fraser-Brunner, Bull. Br. Mus. (Nat. Hist.), Zoology I, No. 6, 1951, p. 95.
Ranzania laevis Munro, The Marine and fresh water fishes of Ceylon, 1955, p. 284.

D. 17-19. A. 18-19. P. 13. Clavus 22.

Height 1.75-2.27 in total length. Head 2.5-2.7. Eye 7-8. Mouth small, vertical. Colour silvery, darker above. Sides with bright silvery transverse bands, the anterior three on head, before and below eye, with black borders, the following ones with black spots. Length 800 mm.

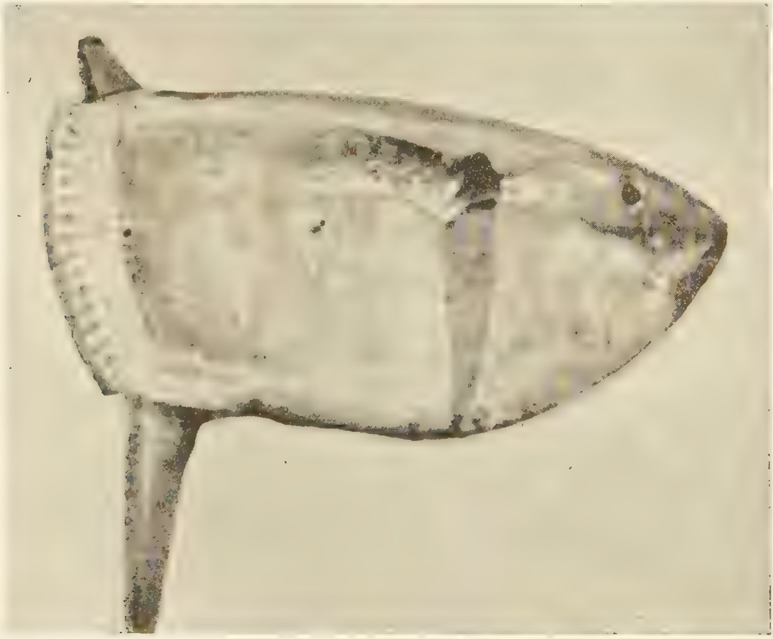

Fig. 90. *Ranzania laevis* (Pennant).
Foto Ch. F. de Vrede.

According to Fraser-Brunner (l.c.) two subspecies can be recognized as follows:

I. Depth of carapace contained twice or more in its length, in adults (up to 580 mm). Axil of pectoral fin well below level of centre of eye. Height of anal fin less than $^{3}/_{5}$ length of head. Atlantic Ocean . . . . R. *laevis laevis.*

II. Depth of carapace contained less than twice in its length, in adults (400-500 mm). Axil of pectoral fin above level of centre of eye. Height of anal fin $^{2}/_{3}$ length of head or more. North Pacific Ocean . . . . R. *laevis makua.*

Intermediate specimens are known from the Indian Ocean and from Australia.

Habitat: New Guinea (Nappan!). — All warm seas.

Note. As far as can be concluded from the photograph of the Nappan specimen it is intermediate between the two subspecies, the depth being about twice the length, the axil of the pectoral above level of centre of eye and the anal, according to another photograph of the same specimen, about $^{3}/_{4}$ length of head.

2. **Masturus** Gill

(Gill, Proc. U.S. Nat. Mus. VII, 1884, p. 425)

Form more or less oval. Skin of body and clavus with small rough denticles. Clavus formed by 20 or more rays, the median rays not branched, and being the remains of the larval caudal fin. These rays produced, supporting a pronounced more or less pointed lobe. Hence the hindborder of the clavus has a median more or less pronounced point. None of the clavus rays bear ossifications distally.

Key to the species of Masturus

a. Chin prominent, upper profile of head evenly convex. Base of dorsal lobe longer than that of anal fin . . . . 1. *M. lanceolatus,* p. 419.

b. Chin not prominent, upper profile of head with a distinct concavity above eyes. Bases of dorsal and anal lobes about equal . 2. *M. oxyuropterus,* p. 421.

1. **Masturus lanceolatus** (Liénard)

Orthagoriscus lanceolatus Liénard, Revue Zool. 1841, p. 291.
Mola lanceolata Barnard, Ann. S. Afr. Mus. XXI, Part 2, 1927, p. 987.
Masturus lanceolatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 474.
Mola lanceolata Barnard, Ann. S. Afr. Mus. XXX, 1935, p. 653.
Masturus lanceolatus Gudger, Proc. Zool. Soc. London, Serie A, 1937, p. 353.
Mola lanceolata J. L. B. Smith, The Sea Fishes of S. Afr. 2nd impress. 1950, p. 422.

Masturus lanceolatus Fraser-Brunner, Bull. Br. Mus. (Nat. Hist.) Zoology I, No. 6, 1951, p. 107.

D + A. + Clavus = 60-62. C. 8 (rarely 7 or 9).

Height more than twice in total length. Head more than 4 in total length. Upper profile of head evenly convex. Chin prominent. Base of dorsal fin lobe conspicuously longer than that of anal fin. Colour dark, lighter blotches on vertical fins may be present. Length over 3000 mm.

Habitat: Atlantic, Indian and Pacific Oceans.

Note. According to Fraser-Brunner (l.c.) this species and *M. oxyuropterus* probably are the sexes of one species. As far as I know *M. lanceolatus* has not yet been recorded from the Indo-Australian Archipelago. Fig. 10 in Fraser-Brunner's article

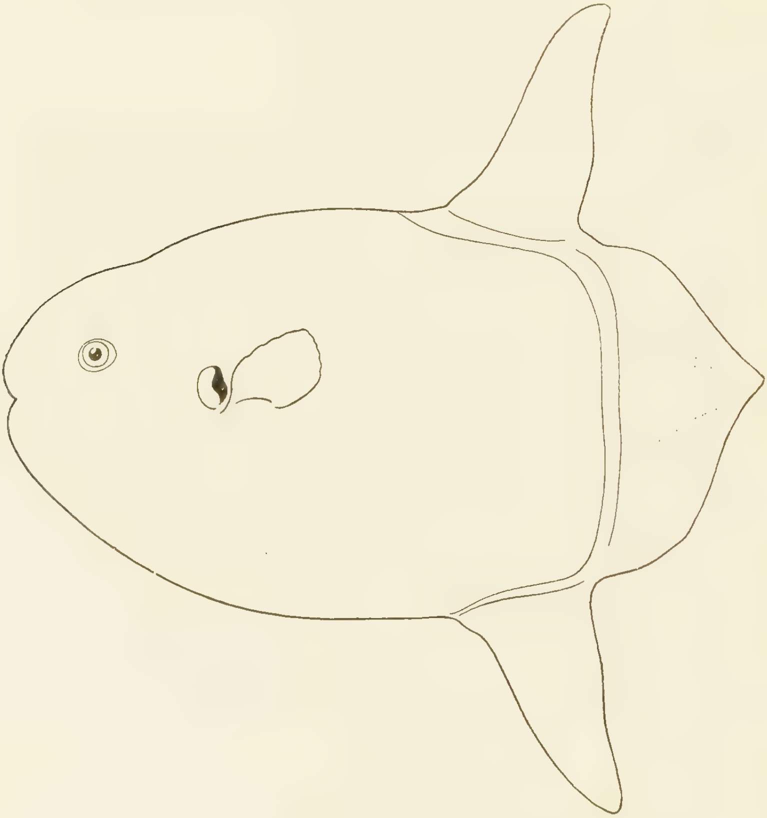

Fig. 91. *Masturus oxyuropterus* (Blkr.) After Fraser-Brunner.

cited above shows a typical lanceolatus, but the legend: "Singapore (After Smedley, 1932)" is a misprint and belongs to Fig. 11, p. 106, which represents *M. oxyuropterus*.

2. **Masturus oxyuropterus** (Blkr.) (Fig. 91, p. 420)

Orthagoriscus oxyuropterus Bleeker, Versl. Akad. Amsterdam (2) VII (1872) 1873, p. 151.

Masturus lanceolatus Jordan & Jordan, Mem. Carnegie Mus. X, 1925, p. 89 (nec Liénard).

Mola lanceolata Smedley, Bull. Raffles Mus. 7, 1932, p. 17 (nec Liénard).

Masturus lanceolatus Gudger, Proc. Zool. Soc. London, Serie A. 1937, p. 353 (partim).

Mola lanceolata Hardenberg, Treubia XVII, 1939, p. 121 (nec Liénard).

Masturus oxyuropterus Fraser-Brunner, Bull. Br. Mus. (Nat. Hist.). Zoology I, No. 6, 1951, p. 107.

D. + A. + Clavus = 55-57. C. 4 (rarely 3 or 5).

Height 1.8-2 in total length. Head about 3.5-4 in total length. Upper profile of head with a distinct concavity above the eyes. Bases of dorsal and anal fin lobes about equal. Colour brown. A dark more or less distinct band along base of dorsal, continued along base of clavus and of anal. Clavus with dark spots or blotches. Length over 2000 mm. (not seen by me).

Habitat: Rhio Archipelago; Bay of Jakarta; Java Sea?; Ambon. — Atlantic, Indic, and Pacific Oceans.

Note. A sunfish, photographed on board H.M. „Noord-Brabant" about 1910 in the Java Sea, possibly belongs to *M. oxyuropterus*. Unfortunately the clavus is not shown, as a sailor is standing in front of it, but the concavity of the profile of the head above the eye is distinct.

3. **Mola** Koelreuter

(Koelreuter, Novi Comment. Acad. Petropol. VIII, 1770, p. 337.)

Orthragoriscus Bloch, Schneider, Syst. Icht. 1801, p. 510.

Orthagoriscus Cuvier, Règne Animal II, 1817, p. 149.

Form more or less oval. Skin of body and clavus with small rough denticles. Clavus formed by 12-16 rays, most of which terminate in an ossification distally. Hindborder of clavus rounded, and lobed. Caudal absent in adults.

Key to the species of Mola

a. Clavus supported by about 12 rays, 8 or 9 of which bear ossicles: the ossicles widely separated. A band of reduced denticles, smoother to the touch, at base

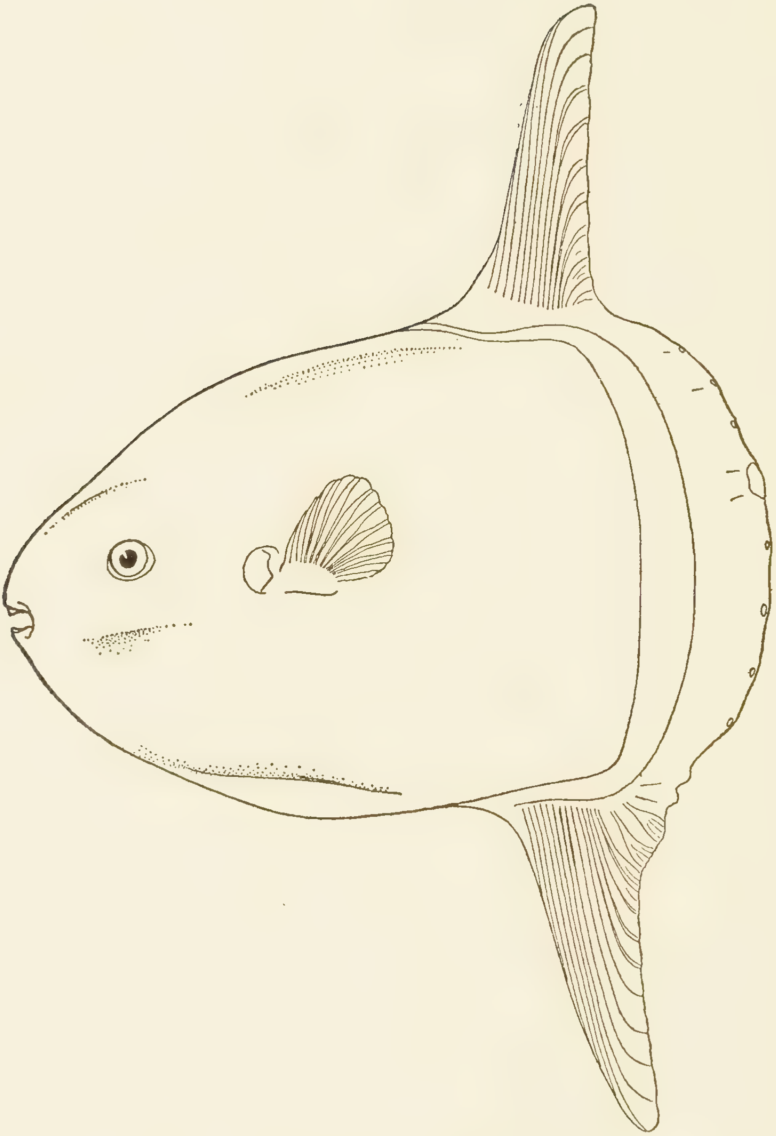

Fig. 92. *Mola mola* (L.). After Fraser-Brunner.

of clavus from dorsal to anal fin . . . . . . 1. *M. mola* p. 423.

b. Clavus supported by about 16 rays, 12 of which bear ossicles, the ossicles much broader than the spaces between them, and forming the margin of the clavus.

No band of reduced denticles between dorsal and anal fins . . . . *2. M. ramsayi* p.

1. **Mola mola** (L.)

Tetraodon mola Linné, Syst. Nat. ed. 10. 1758, I, p. 334.
Mola mola Fraser-Brunner, Bull. Br. Mus. (Nat. Hist.) I, No. 6, 1951, p. 113 (see extensive list of references).

D. 17-18. A. 14-17. Clavus 12. P. 12-13.

Height about 1.5 in total length. Head about 3-3.5 in total length. Snout more or less pointed in adult males, front of the snout nearly vertical in adult females. Clavus forming a series of lobes posteriorly, deeper in males than in females; it is supported by about 12 rays, 8 or 9 of which bear ossicles; the ossicles widely separated. Denticles of body reduced and smoother to touch in a band at base of dorsal, clavus, and anal. Colour greyish or blackish with a more or less distinct silvery hue, back darker. Length over 3000 mm.

Habitat: Atlantic Ocean, apparently rarer in Indian and Pacific Oceans.

Note. No specimens from the Indo-Australian Archipelago are known, but as *Mola mola* has been recorded from Japan, Australia and Hawaii, as well as from Ceylon, its occurrence in this region may be expected.

2. **Mola ramsayi** (Giglioli)

Orthagoriscus ramsayi Giglioli, Nature 28, 1883, p. 315.
Mola ramsayi Whitley, The Austr. Zoologist X, part 1, 1941, p. 49.
Mola ramsayi Fraser-Brunner, Bull. Br. Mus. (Nat. Hist.), Zoology I, No. 6, 1951, p. 110.

According to Fraser-Brunner (l.c.) this species differs from *Mola mola* as indicated in the key. It is known from several localities in the South Pacific but has not been recorded from the Indo-Australian Archipelago.

Order OPISTHOMI

Body elongate and compressed, covered with small scales or naked. Dorsal and anal many-rayed, generally preceded by a series of isolated spines. Anal with or without spines. Pectorals small or well developed, the supracleithrum attached by ligament to the third or fourth vertebra. Ventrals absent. Mouth small or of moderate size, terminal or subterminal, with bands of teeth in the jaws and sometimes on the vomer. A pair of nostrils on each side, the posterior in front of eye, the anterior tubular, at tip of snout. Gill membranes separate or narrowly united, free from isthmus. Vertebrae 70-95; the ribs are inserted on strong parapophyses.

Distribution: Two families of freshwater fishes: *Chauduridae* with a single species known from Burma placed in an order of its own by some authors and *Mastacembelidae* from Africa and Southern Asia.

1. Family Mastacembelidae

Dorsal consisting of a series of isolated spines, followed by a many-rayed soft dorsal. Anal with three spines, the second one strongest and depressible in a groove, the others sometimes hidden below the skin. Snout produced into a fleshy tentacle, the tubular anterior nostrils at its sides near its end. Scales present. Teeth in the jaws villiform, present or absent on vomer.

Key to the Indo-Australian genera of Mastacembelidae

1. Fleshy tentacle of long snout concave and transversely striated inferiorly . . . . 1. *Macroganthus*, p. 424
2. Fleshy tentacle of moderate snout short and not transversely striated . . . . 2. *Mastacembelus*, p. 427

1. **Macrognathus** Lacepède

(Lacepède, Hist. Nat. Poissons II, 1800, p. 283)

Rhynchobdella Bloch Schneider, Syst. Ichth. 1801, p. 478.

Fleshy tentacle on snout concave and transversely striated inferiorly. For other characteristics see those of the single species known.

1. **Macrognathus aculeatus** (Bl.) (Fig. 93, p. 425)

Ophidium aculeatum Bloch, Ausländ. Fische II, 1786, p. 72.
Macrognathus aculeatus Lacepède, Hist. Nat. Poissons II, 1800, p. 283.
Rhynchobdella orientalis Bloch Schneider, Syst. Ichth. 1801, p. 478.
Macrognathus aculeatus Hamilton Buchanan, Fishes of the Ganges, 1822, p. 29.
Rhynchobdella ocellata Cuvier & Valenciennes, Hist. Nat. Pissons VIII, 1831, p. 445.
Rhynchobdella ocellata Bleeker, Verh. Bat. Gen. XXIII, 1850. Bijdr. kennis Notacanthini, p. 5.
Rhynchobdella aculeata Günther, Cat. Brit. Mus. III, 1861, p. 540.
Rhynchobdella aculeata Day, Fishes of India, Part II, 1876, p. 338.
Rhynchobdella aculeata Vinciguerra, Ann. Mus. Civ. Genova XVIII, 1883, p. 652. — Ibid. (2) IX, 1890, p. 178.
Rhynchobdella aculeata Sundara Raj, Rec. Indian Mus. XII, Part IV, 1916, p. 289.
Rhynchobdella aculeata Hora, Journ. Nat. Hist. Soc. Siam VI, No. 2, 1923, p. 180.
Rhynchobdella aculeata Shaw & Shebbeare, Journ. Royal Asiat. Soc. Bengal (3) No. 1, (1937) 1938, p. 127.
Macrognathus aculeatus Munro, The marine and fresh water fishes of Ceylon, 1955, p. 267.
Macrognathus aculeatus Sufi, Bull. Raffles Mus. No. 27. 1956, p. 101.

D^1. XIV-XXII. D^2. 46-54. A. III. 44-54. P. 20-26. Ltr $\begin{array}{c}17\text{—}19\\ \hline 1\\ \hline 24\text{—}33\end{array}$

Body in large specimens much deeper than in small ones. Height 5.7-9.1, 6.1-9.8 in length with caudal. Head 3.8-4.8, 4-5.2 in length with caudal. Eye 7.6-11.7, 4.6-5.6 in snout and slightly less or more than somewhat convex interorbital space. Anterior nostril near the end of the proboscis, tubular, far away from the elongate, slit-like, posterior nostrils which are situated one eye diameter before eye. Scales on sides of head reaching anteriorly to corner of mouth. Upper side of snout, interorbital space and postorbital part of head naked. Gill opening inferior, the skin covering the posterior border of the opercle. First dorsal spine at equal distances of head and first dorsal ray. Dorsal spines more or less hidden in the skin when laid down, the posterior spines longer than the others, about as long as eye, the last spine connected by membrane with the base of the soft dorsal. Median dorsal rays longest, about equal to snout without

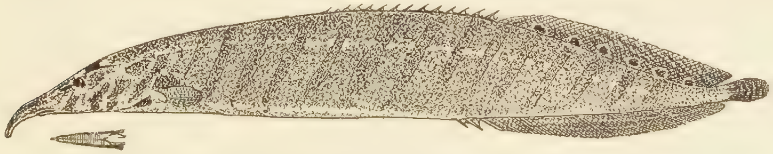

Fig. 93. *Macrognathus aculeatus* (Bl.) × ½.

proboscis. Second anal spine much stronger and longer than the others, one half eye diameter long. Third anal spine minute, often hidden in the skin. Origin of soft anal below origin of soft dorsal. Dorsal and anal generally free from the short, slightly rounded caudal, but sometimes both fins or the anal only are totally confluent with the caudal. Pectorals rounded, their short base low down, their length equal to eye and snout without proboscis. Colour of preserved specimens bluish grey or brown above, lighter below. A light yellowish stripe from behind eye over opercle along lateral line, disappearing or tail. Faint dark, rather broad cross bands over back and on sides, where they often bifurcate, not always distinct, sometimes accompanied with narrow yellow stripes or rows of spots on tail. Two to six large, distant, black, light yellowish edged ocelli along base of dorsal, sometimes partly indicated by two light stripes, sometimes only the upper half of the ocelli is developed. Often a light stripe along base of caudal, sometimes folowed on base of caudal peduncle by a broader black band and again a light stripe, suggesting an elongate ocellus at the end of the row of ocelli along base of dorsal. Caudal and dorsal brown with rows of light spots intermingled with short stripes; anal similar or uniform. Pectorals uniform light or with transverse rows of brown spots. Length 275 mm.

Nomen indig: Berod (Indonesia); Silih (Java).

Habitat: Sumatra (Deli, River Batang Hari!, Lahat, Gunung Sahilan!, Palembang); Java (Jakarta!, Gombong, Ngawi, River Brantas!, Kedu!, Kediri!); Borneo! (Sambas, Sungi-duri, River Kayan). — India, Ceylon, Burma, Siam, Indochina, Korea. In rivers and estuaries.

Note. Günther (l.c) records specimens from Ceram and from the Moluccas. The specimen from Ceram is from the collection of Madame Ida Pfeiffer, whose localities often are erroneous. The provenance of the Moluccas specimen is not known. As *M. aculeatus* never has been found east of Wallace's line, we may take it that both localities are untrustworthy.

M. aculeatus is a very variable species, as often has been remarked. The dorsal spines range between 14 and 22 in the specimens from the Sunda Islands examined by me. I find 14 spines in two specimens from different localities in Sumatra, 19 in one specimen from Borneo, and 17-22 in four specimens from different localities in Java. These numbers are far too small to base any conclusion on them. The way in which the dorsal and anal fins are connected with the caudal too shows much variability. The fusion of the fins is complete in a specimen from Djambi, Sumatra, total length 54 mm and in one from Borneo, total length 217 mm. In a specimen from unknown locality, which lived in the Amsterdam aquarium, only the anal is fused with the caudal, and in all other specimens examined by me from Sumatra and Java, 143-218 mm total length, the caudal is completely free.

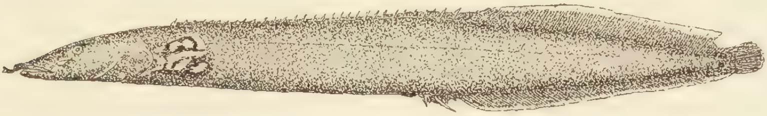

Fig. 94. *Mastacembelus unicolor* C.V. × 4/9.

2. **Mastacembelus** (Gronovius) Scopoli

(Scopoli, Introd. Hist. Nat. 1777, p. 458)

Pararhynchobdella, Bleeker, Versl. Akad. Amsterdam (2) VIII, 1874, p. 368.

Snout not very long, the tip of the upper jaw not much in advance of that of the lower jaw. The short fleshy tentacle on snout not transversely striated.

Key to the Indo-Australian species of Mastacembelus

A. No preopercular spines.
a. Preorbital spine present . . . . 1. *M. maculatus* p. 428
b. No preorbital spine . . . . 2. *M. perakensis* p. 429
B. Preopercular spines present.
a. D. XXVI-XXIX.
a′. Anal equidistant from caudal base and eye . . . . 1. *M. maculatus* p. 428
b′. Anal equidistant from caudal base and pectoral axil. . . . . 3. *M. keithi* p. 430
b. D. XXXI-XI.
a′. Gape of mouth not extending to below posterior nostrils. Head without bands. Origin of soft anal below that of soft dorsal .. . . 4. *M. unicolor* p. 431
b′. Gape of mouth extending to below posterior nostrils. Head with white longitudinal bands (red in life). Origin of soft anal below that of soft dorsal. 5. *M. erythrotaenia* p. 432
c′. Gape of mouth extending to below posterior nostrils or to its anterior border. Head with dark bands. Origin of soft anal before that of solft dorsal . 6. *M. armatus* p. 433

1. **Mastacembelus maculatus** C. V.

Mastacembelus maculatus Cuvier & Valenciennes, Hist. Nat. Poissons VIII, 1831, p. 461.
Mastacembelus maculatus Bleeker, Nat. Tijdschr. Ned. Indië III (1851) 1852, p. 93.
Mastacembelus maculatus Günther, Cat. Brit. Mus. III, 1861, p. 543.
Macrognathus maculatus Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 174.
Pararhynchobdella maculata, Bleeker, Versl. Akad. Amsterdam (2) VIII, 1874, p. 368.
?*Mastacembelus Guentheri* Vaillant, Nouv. Arch. Mus. Hist. Nat. (4) V, 1893, p. 106 (nec Day).
Mastacembelus vaillanti Fowler, Proc. Acad. Nat. Sci. Philadelphia (2) LVII, 1905, p. 491.
Mastacembelus maculatus Boulenger, Journ. Acad. Nat. Sci. Philadelphia (2) XV, 1912, p. 198, p. 200.
Mastacembelus billitonensis de Beaufort, Treubia XVII, Afl. 3, 1939, p. 194.
?*Mastacembelus maculatus guentheri* Herre, Bull. Raffles Mus. 16, 1940, p. 55.
Mastacembelus maculatus Herre, l.c.
Mastacembelus maculatus Sufi, Bull. Raffles Mus. 27, 1956, p. 113.

D. XXVI-XXIX. 60-67. A. III. 57-69. P. 20-25.

Height 9-11.8, 9.5-12.4 in length with caudal. Head 5.8-7.4, 6.1-7.8 in length with caudal. Eye 10.6-15, 4-8.4 in snout. Interorbital space 1.2-2 in eye in small specimens, in large specimens the eye is smaller than the interorbital space. Head above naked, the scales on nape reaching anteriorly to above hindmargin of the preopercle. Maxillary reaching to below nostrils. A well developed preorbital spine. No preopercular spines, but occasionly present (see note below). Penultimate dorsal spine larger than the others, last dorsal spine small, hidden below the skin. Second anal spine much longer than the others Soft anal originating in advance of origin of soft dorsal. Anus at about equal distance from base of caudal and from eye. Pectorals 3.14-4.5 in head. Dorsal and anal totally confluent with caudal. Colour of preserved specimens brown, with more or less distinct dark bands on the back, sometimes continued as narrow reticulations on the belly, or belly uniform light. Fins with pale margins and with more or less distinct dark spots or stripes. Length 280 mm.

Nomen indig.: Tilan.

Habitat: Singapore!; Sumatra (Deli, Upper- and Lower Langkat, Lematang ilir, Tagora River, Pètok!, Lake Korinchi, Lahat, Solok, Kaju Tanam! Pajakumbuh, Wai Lima!, Sungei Penoh, Palembang, Kipahiang); Billiton!; Java (Lebak, Bogor!, Tjipanas, Tjandjur, Djasinga, Tji Barangbang!, Palabuan, Kepong); Borneo (Kina Balu, Kahajan, Seminis). — Siam, Malay Peninsula.

Note. In most cases *M. maculatus* can be distinguished from all other species from the Indo-Australian Archipelago by the absence of preopercular spines and the presence of a preorbital spine, but some specimens have been described which totally agree with *maculatus* excepting the presence of preopercular spines. These specimens have been determined by Vaillant and Herre as *M. guentheri*, but lastnamed species has a scaled snout, wheras it is naked in *maculatus*. Boulenger (l.c.) ranged Vaillant's specimens under *maculatus* and Sufi (l.c) did the same for Vaillant's and Herre's specimens. In a note by Trewavas and Sufi (Sufi, l.c. p. 116) these aberrant specimens are discussed. The habitat Moluccas given by Cuvier and Valenciennes for the type specimen is most probably erroneous. The authors say: "Ils ont été rapportés des Moluques par M. le professeur Reinwardt, de Leyde". Reinwardt visited Java as wel as the Moluccas, but as never a member of the Opisthomi has been found east of Wallace's line, we may take it that a mistake in labeling was made.

I described *M. billitonensis* as a new species misled by Boulenger's key, where *M. maculatus* in placed among the species with the snout entirely scaly. However, the colour pattern of the Billiton specimens, in which the belly is barred with dark stripes, has already been noticed by Bleeker (1852, l.c.) who distinguishes between two varieties of *M. maculatus*:

1. *chrysogaster*, ventre immaculato. Hab.: Java, Sumatra.
2. *dictyogaster*, ventre fusco reticulato. Hab. Billiton.

As Sufi (l.c) rightly remarks, the Billiton population of *M. maculatus* is not sufficiently known to ascertain that all specimens from that island show the same colour pattern, moreover as specimens from Sumatra, Borneo and Malaya are very variable. From Sumatra I recorded two specimens which are indentical with *billitonensis*.

2. **Mastacembelus perakensis** Herre & Myers

Mastacembelus perakensis Herre & Myers, Bull. Raffles Mus. No. 13, 1937, p. 74.
Mastacembelus perakensis Sufi, Ibid. No. 27, 1956, p. 107, p. 117.

D. XXIX. 60. A. III. 58.

Height 8.8, 9.4 in length with caudal. Head 5.87, 6.29 in length with caudal. Eye 12, 5 in snout. Snout entirely scaleless, both above and on the sides. Mouth not nearly extending to below nostril.

No trace of preorbital or preopercular spines. Last dorsal spine very small, somewhat detached, and almost concealed. Three anal spines close together, the second one longest. Dorsal completely confluent with the rounded caudal; anal continuous with the caudal but with an inconspicuous notch at the juction. Anus midway between base of caudal and vertical limb of preopercle. Colour in alcohol bluish slate, becoming marbled with yellow on lower and posterior parts. Dorsal and anal yellow with black diagonal bands, the margins whitish. Length 150 mm. (Not seen by me, copied from Herre & Myers).

Habitat: Singapore. — Perak.

Note. As already remarked by Sufi (l.c.), this species is closely related to *maculatus*.

3. **Mastacembelus keithi** Herre

Mastacembelus keithi Herre, Bull. Raffles Mus. No. 16, 1940, p. 24.
Mastacembelus keithi Sufi, Ibid. No. 27, 1956, p. 107, p. 117.

D. XXVI-XXVII. 56-58. A. III. 48-60. P. 26.

Height 6.8-7.35. Head without rostrum 5. Eye 10-10.85 in head without rostrum, 3.2-3.4 in the snout without rostrum. Snout naked, with a few scales between eye and nostril. The mouth does not extend to a vertical from the nostril. A preorbital spine present. Two preopercular spines. Origin of dorsal on a vertical behind the end of the pectorals. Last dorsal and anal spines very small and more or less concealed in thick skin. Anal spines close together. Soft anal originating just below the soft dorsal. Caudal free from both dorsal and anal, or united at its base with these fins. Anus equidistant from the caudal base and the pectoral axil. Colour in alcohol dusky brown, paler below, with narrow vertical cross bars of very pale reddish brown or whitish, which divide the ground colour into 2 or more dusky cross bars, wider than the pale bands, and descending to the abdominal region and anal. Scattered over the sides and particularly abundant below the lateral line are white dots or circular spots; a black stripe extends from the rostral tip across the eye to the angle of the opercle, and usually backward on the trunk for a distance nearly equal to head. Dark marks on the dorsal base opposite either the dark or the pale bars on the body. On the anal base is a row of white or clear spots. Soft dorsal and caudal barred with dusky lines. Anal dark brown with a white margin. Pectoral base with a dusky cross bar or with a small dark spot near its upper end. Length 208 mm. (After Herre and Sufi, not seen by me).

Habitat: Borneo (Rivers Gum Gum, Segalind, and Kabili in Sandakan district).

4. **Mastacembelus unicolor** C. V. (Fig. 94 p. 427)

Mastacembelus unicolor Cuvier & Valenciennes, Hist. Nat. Poissons VIII, 1831, p. 453.

Mastacembelus marginatus Bleeker, Nat. & Geneesk. Arch. Ned. Indië II (3), 1845, p. 517.

Mastacembelus unicolor Bleeker, Verh. Bat. Gen. XXIII (1849) 1850. Bijdr. kennis Notacanthini, p. 5.

Mastacembelus unicolor Günther, Cat. Brit. Mus. III, 1861, p. 542.

Mastacembelus unicolor Day, Fishes of India, Part II, 1876, p. 339.

Mastacembelus unicolor Vinciguerra, Ann. Museo Civico Storia Nat. Genova (2) IX, 1890, p. 179.

Mastacembelus unicolor Reuvens, Notes Leyden Mus. XVI, 1894, p. 176.

Mastacembelus unicolor Fowler, Journ. Acad. Nat. Sci. Philadelphia (2) XII, Part 4, 1904, p. 501. Proc. ibid. (2) LVII, 1905, p. 489.

Mastacembelus dayi Boulenger, Journ. ibid. (2) XV, 1912, p. 198, p. 200.

Mastacembelus unicolor Boulenger, l.c.

Mastacembelus unicolor Sufi, Bull. Raffles Mus. No. 27, 1956, p. 107, p. 127.

D. XXXI-XXXV. 79-88. A. III. 70-88. P. 23-24.

Height 8.39-9.65, 8.8-10.1 in length with caudal. Head 4.89-5.5, 5.14-5.8 in length with caudal. Eye 9.3-10.5, 3.14-4.3 in snout. Convex interorbital space 1.2-2 in eye. Snout naked. Preorbital spine present. Gape of mouth not extending to below posterior nostrils. Two to four preopercular spines. First dorsal spine above middle of pectorals. Penultimate dorsal spine longer than the others, the last spine minute and hidden below the skin. Second anal spine much longer than the others, the third spine minute and often hidden below the skin. Dorsal and anal more or less confluent with base of caudal. Anus at equal distance of base of caudal and of hindborder of preopercle or of eye. Pectorals rounded, 3.1-3.5 in head. Colour of preserved specimens brown, paler below. Sides uniform or with longitudinal rows of irregular creamy blotches or interrupted bands. In some cases these blotches are darker than the ground colour. Dorsal, anal, and caudal of the same colour as the body, but, with a narrow white terminal band. Pectorals white with two or three dark vertical bands, the outer bands often double by a white patch in its middle. Length 550 mm.

Habitat: Sumatra (Laut Tador, Upper Langkat, Deli, Siboga, Pajakombo, Taluk!, Solok!, Lake of Singkarah!, Padang, Batang! Batu Sangkar, Bingin Telok, River Rawa); Banka; Java (Jacarta, Bogor!, Lebak, Tjandjur, Garut!, Purworedjo, Modjokerta, Surakarta, Surabaya, River Brantas); Borneo (Baram basin, River Kapuas, River Bo). — Malay Peninsula, Burma.

Note. Boulenger (l.c.) erroneously states that *uniclor* has no preopercular spines and hence considered *unicolor* as described by Day as a new species: *M. dayi*.

5. **Mastacembelus erythrotaenia** Blkr

Mastacembelus erythrotaenia Bleeker, Verh. Bat. Gen. XXIII, 1850. Bijdr. kennis Notacanthini, p. 6. Nat. Tijdschr. Ned. Indië I, 1850, p. 10.
Mastacembelus erythrotaenia Günther, Cat. Brit. Mus. III, 1861, p. 542.
Mastacembelus argus Günther, l.c.
Macrognathus erythrotaenia Bleeker, Ned. Tijdschr. Dierk. II, 1865, p. 174.
Mastacembelus erythrotaenia Boulenger, Journ. Acad. Nat. Sci. Philadelphia (2) XV, 1912, p. 198, p. 201.
Mastacembelus erythrotaenia Rendahl, Nyt. Mag. f. Naturvidensk. No. 6, 1922, p. 202.
Mastacembelus erythrotaenia Sufi, Bull. Raffles Mus. No. 27, 1956, p. 107, p. 130.

D. XXXII-XXXVIII. 70-76. A. III. 70-73. P. 24.

Height 8.66-9.2. Head 5.1-6. Eye 12.2-16.1, 4.58-6.48 in snout. Interorbital space 1.1-1.68 in eye. Maxillary reaching to below nostrils. Head naked above, posteriorly to above hindmargin of preopercle. A well developed preorbital spine. Three preopercular spines. Dorsal originating above posterior part of pectorals. Dorsal spines increasing in length posteriorly, the penultimate one much longer than the others, the last one small and hidden below the skin. Second anal spine much longer than the others. Origin of soft anal below that of soft dorsal. Dorsal and anal totally confluent with caudal. Anus much nearer to base of caudal than to tip of snout. Pectorals rounded, 2.9-3.64 in head. Colour of preserved specimens brown. Head with white longitudinal bands (red in life), more or less lost or broken into stripes and spots on the body. All fins with a white border. Length 760 mm.

Habitat: Sumatra (Palembang, Muara Kompeh, Batang Hari!, Sungei Mahe, Laut Tador, Indragiri, Lower Langkat, Deli); Java (Kali Brantas!?); Borneo, (Sambas, Pontianak, Sintang, Banjermasin, Bulungan, Kuching). — Malay Peninsula, Indo-China, Siam. In fresh water.

Note. The habitat "Java" is based on a specimen which lived in the Amsterdam aquarium from 1927 to 1936 and was presented by Captain Terwiel, who got most of his fishes from Mr. Sieveking in Surabaya and who collected in the River Brantas. As no other specimens of *M. erythrotaenia* have ever been found in Java, it is very doutbful if the fish, now in the collections of the Amsterdam Zoological Museum, really came from that island.

6. **Mastacembelus armatus** (Lac.)

Macrognathus armatus Lacepède, Hist. Nat. Poissons II, 1800, p. 286.
Rhynchobdella polyacantha Bloch Schneider, Syst. Ichth. 1801, p. 479.
Macrognathus armatus Hamilton Buchanan, Fishes of the Ganges, 1822, p. 28.
Mastacembelus armatus Cuvier & Valenciennes, Hist. Nat. Poissons VIII, 1831, p. 456.
Mastacembelus armatus Bleeker, Verh. Bat. Gen. XXV, 1853, Nalez. ichth. fauna Bengalen, p. 97.
Mastacembelus armatus Günther, Cat. Brit. Mus. III, 1861, p. 542.
Mastacembelus armatus Day, Fishes of India, Part II, 1876, p. 340.
Mastacembelus armatus Vinciguerra, Ann. Mus. Civic. Genova (2) IX, 1890, p. 180.
?*Mastacembelus armatus* Vaillant, Notes Leyden Mus. XXIV, 1902, p. 157 (partim?). — Mission Pavie, 1904, p. 469.
Mastacembelus armatus, var.?, Duncker, Mitt. Naturh. Mus. Hamburg XXI, 1904, p. 166.
Mastacembelus armatus Boulenger, Journ. Acad. Nat. Sci. Philadelphia (2) XV, 1912, p. 198, p. 200.
Mastacembelus armatus Zugmayer, Abh. Kön. Bayer. Akad. Wiss. XXVI, Abh. 6, 1913, p. 34.
Mastacembelus armatus Hora & Mukerji, Rec. Ind. Mus. XXXVIII, Part II, 1936, p. 145.
Mastacembelus armatus Shaw & Shebbeare, Journ. Roy. Asiat. Soc. (3) III, No. 1 (1937), 1938, p. 126.
Mastacembelus armatus Herre, Bull. Raffles Mus. No. 16, 1940, p. 54.
Mastacembelus armatus armatus H. M. Smith, U.S. Nat. Mus. Bull. 188. 1945, p. 63.
Mastacembelus armatus Sufi, Bull. Raffles Mus. No. 27, 1956, p. 107, p. 134.

D. XXXII-XL. 64-91. A. III. 64-90. P. 21-27.

Height 7.7-13.8. Head 4.7-6.5. Eye 6.9-13.8, 2.8 in snout and more than convex interorbital space. Head naked above, backwards as far as vertical through hindborder of preopercle. A sharp preorbital spine. Two to five spines at edge of preopercle, the superior one largest, the last one minute. Maxillary reaching to below posterior nostril. Origin of dorsal above middle of pectorals. Spines slightly increasing in length posteriorly. Origin of anal before that of soft dorsal. Second anal spine largest. Dorsal and anal confluent with base of caudal. Pectorals rounded, 3.7 in head. Colour of a specimen from Taluk, Sumatra, standard length 134 mm: reddish brown above, creamy below and on sides of head. A brown band on cheeks, vertically down from eye; another patch of the same colour down from below preopercular spines. A creamy stripe from proboscis through interorbital space along base of spinous dorsal. A longitudinal row of small creamy distant spots along upper part of sides. Soft dorsal, anal, and caudal white with a series of black dots, except anterior part of dorsal. Soft dorsal with a narrow subterminal black longitudinal band. Pectorals hyaline with a brown spot at their base. According to Sufi (l.c.) the colour in this species is subject to considerable variation. The colour of the Singapore and Sumatra specimens described by Sufi is much like that of the Taluk specimen. Length 700 mm.

Habitat: Singapore, Sumatra (Deli, Taluk!); Java (Palabuan); Borneo (River Kapuas). — Balutschistan, Pakistan, India, Ceylon, Burma, Tenasserim, Siam ,Malay Peninsula, Indo-China, China, Hanau. In fresh and brackish water.

Note. Karoli (Termeszetrajzi füzetek V, 1882, p. 23) is the only author who mentions this species from Java. I have reason to doubt the correctness of this statement.

Order DISCOCEPHALI

Mouth not protractile, the lower jaw projecting. Teeth in bands in upper and lower jaw, on vomer and on elongate palatines. Canines or caninoid teeth may be present. In many species the outer border of the upper jaw has an outer row of more or less flexible, close set, small hooked teeth ("dents en cils"). Two dorsals, the first spinous one transformed into a flat, oval, transversely laminated adhesive disc, which extends forward on the upper surface of the depressed head; the spines are shortened, depressed backwards, and expanded transversely to form pairs of broad flat laminae which are denticulated posteriorly; in the middle line posterior projections of each pair of laminae are connected by ligament ,and a low fin-membrane joins them to the next pair ¹). Second dorsal and anal rather long. Caudal truncate or emarginate; in young ones the median caudal rays may be produced. Ventrals at a short distance behind origin of pectorals. Scales small, cycloid.

Distribution. These sea fishes attach themselves by means of the suctorial disk to other large fishes, turtles, cetaceans and sometimes even to vessels Hence they have a wide distribution in all warm seas.

1. Family ECHENEIDIDAE

For characteristics of the only recent family see those of the order.

Key to the Indo-Australian genera of Echeneididae

1. 9-11 laminae in disk. No "dents en cils". P. pointed . . . . 1. *Phtheirichthys* p. 435
2. 12-30 laminae in disk. "Dents en cils" present. P. rounded, seldom pointed . . . . 2. *Echeneis* p. 436

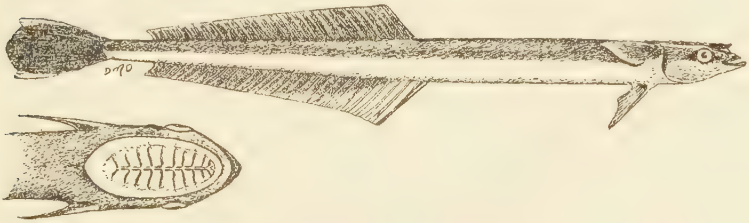

Fig. 95. *Phtheirichthys lineatus* (Menz.). After J. L. B. Smith.

1. **Phtheirichthys** Gill

(Gill, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 239)

Much elongate. Suctorial disk with 9-11 laminae. Second dorsal

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1) See Tate Regan, Ann. Mag. Nat. Hist. (8) X, 1912, p. 634.

with 31-38 rays, anal with 31-38 rays. Strong caninoid teeth in both jaws. No "dents en cils". Palate with blunt teeth. Pectorals pointed.

Phtheirichthys lineatus (Menz.) (Fig. 95, p. 435)

Echeneis lineata Menzies, Trans. Linn. Soc. I, 1791, p. 187.
Echeneis lineata Bloch, Schneider, Syst. Ichth. 1801, p. 240.
Echeneis lineata Günther, Cat. Brit. Mus. II, 1860, p. 382.
Echeneis lineata Lütken, Vidensk. Meddel. naturh. Foren. 1875, p. 36 (French summary, p. 5).
Echeneis lineata Günther, Fische der Südsee II, 1876, p. 156.
Echeneis lineata Reuvens, Notes Leiden Mus. XVI, 1894, p. 156.
Echeneis lineata Franz, Abh. Bayer. Akad. Wiss. IV, Suppl. Bd. I. Abh. 1910, p. 70.
Phtheirichthys lineatus Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 421.
Phtheirichthys lineatus Schulz, Bull. U.S. Nat. Mus. 180, 1943, p. 257, p. 259.
Phtheirichthys lineatus J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 341.
Phtheilichthys[1]) *lineatus* Kamohara, Rep. Usa Marine Biol. Station, Vol. 6, no. 2, 1959. p. 6.

D^1. XI. D^2. 35. A. 33. P. 3. 15. V. 1. 5.

Height 12.6, 14.6 in length with caudal. Head 6.5, 7.5 in length with caudal. Eye 5.2, twice in snout. Suctorial disk elongate oval, its breadth 2.75 in its length, its posterior end above beginning of second third of pectoral. No "dents en cils". Several rows of strong caninoid teeth in both jaws, more blunt teeth on palate. Scales minute, cycloid. Second dorsal gradually diminishing in height posteriorly, the longest rays about 1.3 in head. Anal similar to dorsal, its origin and its end below origin and end of second dorsal. Longest anal rays 1.57 in head. Pectorals and ventrals pointed. Caudal somewhat wedge-shaped. Colour of preserved specimen black above, light below. Dorsal and anal black with white outer borders. Caudal black with white sides. Pectoral dusky to blackish, the upper border light. Description made after the specimen known from Rotti, 390 mm long (vide Reuvens, l.c.). The species can attain a length of 750 mm.

Habitat: Singapore; Rotti!; New Guinea (Madang) — Warm parts of Atlantic, Indic and Pacific.

2. **Echeneis** Linné

(Linné, Syst. Nat. ed. X, Vol. I, 1758, p. 260)

Remora Forster, Cat. Animals N. America, 1771, p. 20.
Remoropsis Gill, Proc. Acad. Nat. Sci. Philadelphia, 1863, p. 88.
Leptecheneis Gill, ibid. XVI, 1864, p. 60.
Remorina Jordan & Evermann, Bull. U. S. Nat. Mus. XLVII, 1896, p. 490.

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1) errore!

Moderately elongate. Suctorial disk with 12-30 laminae. Second dorsal with 17-36 rays, anal with 16-36 rays. "Dents en cils" present. Caninoid teeth or canines may be present in the jaws and on the palate. Pectorals rounded or pointed.

Key to the Indo-Australian species of Echeneis

A. Posterior end of suctorial disk not reaching end of pectorals.
  a. 14-19 laminae in disk. Caninoid teeth in jaws and on palate.
    a^1. D^2. 20-24. A. 20-24. P. rounded (*Remora*) . . . . 1. *E. remora* p. 437
    b^1. D^2. 27-30. A. 25. P. rounded (*Remoropsis*) . . . . 2. *E. sex-decimlamellata* p. 439
  b. 22-27. laminae in disk. No caninoid teeth. D^2. 33-36. A. 33-36. P. pointed (*Leptecheneis*) . . . . 3. *E. naucrates* p. 439
B. Posterior end of suctorial disk not quite reaching end of pectorals. 12-13 laminae in disk P. rounded (*Remorina*) . . . . 4. *E. albescens* p. 441
C. Posterior end of suctorial disk reaching far behind end of pectorals.
  a. 17-20 laminae in disk. P. rays strongly ossified (*Rhombochirus*) . . . . . 5. *E. osteochir* p. 442
  b. 24-28 laminae in disk. P. rays not strongly ossified (*Remilegia*) . . . 6. *E. australis* p. 443

1. **Echeneis remora** L.

Echeneis remora Linné, Syst. Nat. ed. X. Vol. I, 1758, p. 260.
Echeneis remora Bloch, Ausländ. Fische II, 1786, p. 134.
Echeneis remora Bloch, Schneider, Syst. Ichth. 1801, p. 240.
Echeneis remoroides Bleeker, Nat. Tijdschr. Ned. Indië IX, 1855, p. 70.
Echeneis remora Günther, Cat. Brit. Mus. II, 1860, p. 378.
Echeneis remora Kner, Novara Exp. Fische, 1865-1867, p. 146.
Echeneis remora Steindachner, Sitzber. Akad. Wien, 1866, p. 448.
Echeneis remora Lütken, Vidensk. Meddel. naturh. Foren. 1875, p. 37 (French summary p. 5).
Echeneis remora Day, Fishes of India, Part II, 1876, p. 258.
Echeneis remora Günther, Fische der Südsee II, 1876, p. 156.
Echeneis remora Macleay, Descr. Cat. Austr. Fish. I, 1881, p. 196.
Echeneis remora Sauvage, Poissons de Madagascar, 1891, p. 323.
Echeneis remora Lönnberg, Bih. Svenska Akad. XXII, 1896, No. 1, p. 25.
Echeneis remora Steindachner, Denkschr. Akad. Wien LXX, 1900, p. 496.
Echeneis remora Jordan & Evermann, Bull. U.S. Fish. Comm. XXIII (1903) 1905, p. 494.
Remora remora McCulloch, Austr. Zoologist II, Part III, 1922, p. 115.
Echeneis remora Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 422.

Echeneis remora Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 419.
Remora remora Lin, Lingnam Sci. Journ. 13, No. 4, 1934, p. 689.
Remora remora J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 341.
Remora remora Maul, Bol. Mus. Municipal Funchal IX, Art 23, 1956, p. 45.

D^1. 17-19. D^2. 20-24. A. 20-24. P. 22-26. V. 1. 5.

Height 8, 9.4 in length with caudal. Head 3.77, 4.4 in length with caudal. Eye 4.5, 1.75 in snout. End of suctorial disk not reaching end of pectorals. A row of close set small hooked teeth in front part of upper jaw ("dents en cils"), followed by several rows of large caninoid teeth. Palate with caninoid teeth. Lower jaw with several rows of caninoid teeth, no canines. Origin of anal below origin of dorsal. Longest dorsal rays scarcely longer than snout, longest anal rays somewhat longer. Pectorals rounded, as long as pointed ventrals and slightly less than snout and eye together. Caudal slightly forked. Colour of preserved specimens uniform greyish or blackish. Length 200 mm. (Specimens of *E. remoroides* of Bleeker' collection in the Leiden Museum examined).

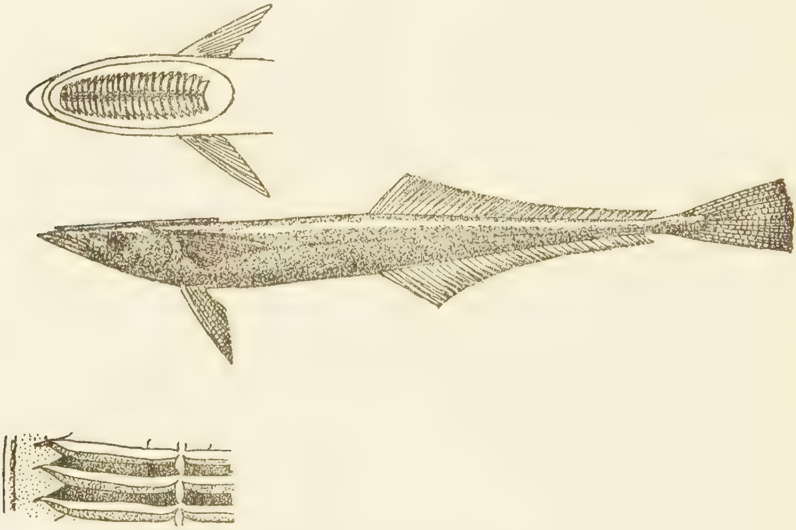

Fig. 96. *Echeneis naucrates* L. × 1/4.
Head from above and detail of disk.

Habitat: Batu Islands!; Celebes (Makassar); Flores Sea!; off Sumba!; Ambon! — All temperate and tropical seas. Specially found attached to sharks.

2. **Echeneis sex-decimlamellata** Eydoux & Gervais

Echeneis sex-decimlamellata Eydoux & Gervais, Voy. Favorite, Poissons, p. 1. In: Guérin, Mag. de Zool. 1837.
Echeneis brachyptera Lowe, Proc. Zool. Soc. 1839, p. 89.
Echeneis Nieuhofi Bleeker, Nat. Tijdschr. Ned. Indië IV, 1853, p. 279.
Echeneis brachyptera Günther, Cat. Brit. Mus. II, 1860, p. 378. — Fische der Südsee II, 1876, p. 155.
Echeneis brachyptera Day, Fishes of India, Part II, 1876, p. 258.
Echeneis brachyptera Steindachner & Döderlein, Denkschr. Akad. Wien XLIX, 1884, p. 182.
Echeneis brachyptera Klunzinger, Fische des rothen Meeres I, 1884, p. 115.
Remora sex-decimlamellata Jordan & Snyder, Proc. U.S. Nat. Mus. XXIII, 1907, p. 759.
Echeneis brachyptera Barnard, Ann. S. Afric. Mus. XXI, Part II, 1927, p. 421.
Remoropsis brachyptera Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 421.
Remora brachyptera J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 342.
Remoropsis brachypterus Maul. Bol. Mus. Municipal Funchal, IX, art 23, 1956, p. 52.

D^1. 15-16. D^2. 27-30. A. 25. P. 21-22. V. 1. 4.

Height 7.4, 8.9 in length with caudal. Head 3.9-3.97, 4.6-4.78 in length with caudal. Eye 5.3-6-7, twice to 2.57 in snout. Suctorial disk elongate oval, its breadth a little more than twice in its length, its posterior end not reaching end of pectorals. A row of close set, small hooked teeth in front part of upper jaw ("dents en cils") followed by 3-4 rows of large caninoid teeth, the innermost row consisting of larger teeth. Palate with large caninoid teeth. Lower jaw with caninoid teeth and some large canines. Origin of anal slightly behind origin of second dorsal. Longest dorsal rays equal to length of snout, longest anal rays somewhat longer. Pectorals rounded, about as long as longest anal rays. Ventrals pointed, about half length of head. Caudal truncate ,the tips slightly produced. Length 300 mm. (Specimens of *E. nieuhofi* from Bleeker's collection in the Leiden Museum examined).

Habitat: Sumatra (Priaman). — Coast of E. Africa, Madagascar, Red Sea, seas of India, Japan, China, New Zealand, Hawaii, warm parts of Atlantic.

3. **Echeneis naucrates** L. (Fig. 96, p. 438)

Echeneis neucrates Linné, Syst. Nat. ed. X. Vol. I, 1758, p. 260. (misprint for *naucrates*).
Echeneis neucrates Bloch, Ausländ. Fische II, 1786, p. 131.
Echeneis neucrates Bloch, Schneider, Syst. Ichth. 1801, p. 239.
Echeneis vittata Rüppell, Neue Wirbelthiere, 1835-1840, p. 82.

Echeneis naucrates Richardson, Ann. Mag. Nat. Hist. XI. Suppl. 1843, p. 498. · Rep. 15th. meeting Brit. Ass. Ichth. China, 1846, p. 205.

Echeneis naucrates Cantor, Journ. Asiat. Soc. Bengal XVIII, 1850,, p. 1181.

Echeneis neucrates Bleeker, Verh. Bat. Gen. XXIV, 1852. Bijdr. kennis Echenoïdei, p. 22.

Echeneis pacifica Duméril, C. R. Acad. Sci. XLVII, 1858, p. 374.

Echeneis coronata Guichenot, l.c.

Echeneis naucrates Günther, Cat. Brit. Mus. II, 1860, p. 384.

Echeneis naucrates Kner, Novara Exp. Fische, 1865-1857, p. 146.

Echeneis naucrates Klunzinger, Verh. zool. bot. Ges. Wien XXI, 1871, p. 446.

Echeneis naucrates Lütken, Vidensk. Meddel. naturh. Foren. 1875, p. 33 (French summary p. 4).

Echeneis naucrates Günther, Fische der Südsee II, 1876, p. 156.

Echeneis naucrates Day, Fishes of India, Part II, 1876, p. 257.

Echeneis naucrates Klunzinger, Fische des rothen Meeres I, 1884, p. 115.

Echeneis naucrates Sauvage, Poissons de Madagascar, 1891, p. 321.

Echeneis naucrates Lönnberg, Bih. Svenska Akad. XXII, 1896, No. 1, p. 25.

Leptecheneis naucrates Jordan & Seale, Bull. Bur. Fish. XXV, 1906, p. 411. — Ibid. XXVI, 1907, p. 40.

Echeneis naucrates Bamber, Journ. Linn. Soc. Zool. XXXI, 1915, p. 485.

Leptecheneis naucrates Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 420.

Leptecheneis naucrates Fowler, Mem. B. P. Bishop Mus. X, 1928, p. 420.

Echeneis naucrates Machan, Ann. naturh. Mus. Wien XLIV, 1930, p. 439.

Leptecheneis naucrates Fowler, Occ. Papers B. P. Bishop Mus. IX, 1932, p. 14.

Echeneis naucrates Herre, Zool. Ser. Field Mus. Nat. Hist. XXI, 1936, p. 394.

Leptecheneis naucrates Fowler, Hongkong Nat. 6. Suppl. 1938, p. 40. — Monogr. Acad. Nat. Sci. Philadelphia 2, 1938, p. 115.

Echeneis naucrates Herre, Rec. Indian Mus. XLI, 1939, p. 350.

Echeneis naucrates Schultz, U.S. Nat. Mus. Bull. 180, 1943, p. 260.

Echeneis naucrates Blegvad, Danish, Invest. Iran. III, 1944,, p. 209.

Echeneis naucrates J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 342.

Echeneis naucrates Maul. Bol. Mus. Municipal Funchal, IX art 23, 1956, p. 20.

D^1. 22-27. D^2. 33-36. A. 33-36. P. 1. 19-20. V. 5.

Height 10.7-12.5, 12.2-14 in length with caudal. Head 4.5-4.8, 5.1-5.3 in length with caudal. Eye 5.2-6.1, 2.2-2.4 in snout. Suctorial disk generally with 23 or 24, seldom with 22 or 25-27 pairs of laminae. The disk is elongate oval, its breadth somewhat more than twice in its length, its anterior end slightly behind symphysis of upper jaw, its posterior end above last half of pectorals. Lower jaw produced before upper jaw, pointed, with rather broad bands of villiform teeth, the bands of both sides separated by a narrow interspace at symphysis and tapering posteriorly. Upper jaw with an outer row of "dents en cils", followed by a narrow band of small pointed teeth. Vomer and palatines with minute villiform teeth. Corner of mouth at level of middle of eye. Anterior and posterior nostrils close together, separated by the base of the valve of the anterior one, situated about midway between upper border of eye and tip of snout. Scales minute, cycloid, those between base of ventrals and isthmus somewhat larger and very elongate. Head scaleless. Origin of second dorsal about midway between tip of snout and base of caudal. Anterior rays longest, about equal to length of snout, rapidly decreasing in length in the anterior fifth part of the fin and almost of equal length in the rest of the fin. Origin of anal below or slightly behind origin of second dorsal. Anal similar to, and as long as second dorsal. Pectorals pointed, the longest upper rays equal to or slightly more than their distance from anterior border of eye. Ventrals pointed, about as long as pectorals. Caudal pointed in young specimens, almost truncate or trilobated in older ones, the middle lobe the longer. Least height of caudal peduncle 2-3 in its length. Colour of preserved specimens light or dark brown.

A dark, broad band from snout through eye and base of pectoral to caudal, generally covering the whole basal half of the fin, tapering again distally and leaving the sides of the distal part of the caudal white. Second dorsal and anal white, light brownish at base. Ventrals light brown, pectorals dark. Young specimens sometimes entirely dark brown, the distal sides of the caudal only white. Length more than 1000 mm.

Habitat: Singapore; Bintang; Sumatra (Atcheen, Tandjong Pura, Bagan Si Api Api!, Rokan!); Nias!; Batu Islands!; Banka; Billiton; Java (Jacarta, Panara, Tiku, Patjitan); Bali; Borneo (Sampit, Balik Papan!); Celebes (Menado!, Badjoa, Makassar!); Ternate; Halmahera; Obi; Batjan; Buru; Ceram, Ambon; Kangean Islands!; Flores!; Lakahia; Timor!; Kei Islands!; Aru Islands!; Waigeu; New Guinea (Merauke!, Mysore, Mios Korwar). — All warm seas.

4. **Echeneis albescens** Temm. & Schlegel

Echeneis albescens Temminck & Schlegel, Fauna Japonica, Pisces, Part 6, 1850, p. 272.

Echeneis albescens Bleeker, Acta Soc. Sci. Indo-Neerl. VI. Bijdr. kennis vischfauna Nieuw-Guinea, 1859, p. 20.

Echeneis albescens Günther, Cat. Brit. Mus. II, 1860, p. 377.

Echeneis albescens Day, Fishes of India, Part II, 1876, p. 258.

Echeneis albescens Günther, Fische der Südsee II, 1876, p. 155.

Echeneis albescens Sauvage, Poissons de Madagascar, 1891, p. 320.

Echeneis albescens Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 494.

Echeneis albescens Barnard, Ann. S. Afric. Mus. XXI, Part 2, 1927, p. 421.

Remorina albescens Wu, Contr. biol. lab. Sci. Soc. China. Zool. Series VII, No. 1, 1931, p. 55.

Echeneis albescens Martin, Philipp. Journ. Sci. 66, No. 3, 1938, p. 387.
Remora albescens J. L. B. Smith, The Sea Fishes of S. Africa, 2nd impress. 1950, p. 341.
Remorina albescens Maul, Bol. Mus. Municipal Funchal IX, Art. 23, 1956, p. 66.

D¹. 12-13. D². 17-22. A. 16-22. P. 16-19. V. 1. 5.

Height 8.5, 11.7 in length with caudal. Head 3.69, 4.4 in length with caudal. Eye 8.8, 3.66 in snout. Suctorial disk oval, its breadth twice in its length, its posterior end not quite reaching end of pectorals. A row of close set small hooked teeth in front part of upper jaw ("dents en cils"), followed by several rows of shorter and more distant teeth. A row of large hooked canines, followed by smaller ones on palate. Lower jaw with an outer row of distant canines, followed by a band of cardiform, hooked teeth. Anal beginning before second dorsal and ending below end of dorsal. Pectorals rounded. Caudal truncate. Colour of preserved specimen uniform brownish. (A specimen of Bleeker's collection in the Leiden museum examined). Length 300 mm.

Habitat: Ternate; Batjan; New Guinea (Manokwari); N. of New Guinea. — Coast of S. Africa, Réunion, seas of India, Japan, China, Philippines, Marcus Island, Hawaii, Marquesas Islands, Atlantic.

5. **Echeneis osteochir** Cuvier

Echeneis osteochir Cuvier, Règne Animal, ed. 2. II, 1829, p. 348.
Rhombochirus osteochir Maul, Bol. Mus. Municipal Funchal IX, Art. 23, 1956, p. 26.

D¹. 17-20. D². 25. A. 25. P. 22. V. 6.

Height 6.4. Head 5.3. Eye 7, 2.7 in snout. Suctorial disk elongate oval, generally with 18 laminae, its breadth 2.2 in its length, its posterior end far behind end of pectorals. "Dents en cils" in a single row and minute. A narrow band of rather few moderately sturdy teeth on premaxillaries and a narrow band along edge of mandible, some of the outer teeth rather large. Palatines with a broad band of minute teeth, with one row of strong ones along the outside, continuing along the anterior edge of the vomer. Soft dorsal and anal fairly high throughout, but higher anteriorly. Upper and lower border of pectorals straight and more or less of equal size. Hind-border only slightly rounded. The upper border is formed by the edge of the first ray, the hind one by the ends of the eleven upper rays, and the lower one by the end of the remaining eleven lower rays. All the rays are strongly ossified and curved. Ventrals moderately long and pointed. Uniform fawn. Fins whitish with darker edges. Length over 200 mm. (Compiled, not seen by me).

Habitat: New Guinea (Humboldt's Bay). — Atlantic.

6. **Echeneis australis** Bennett

Echeneis australis F. D. Bennett, Narative of a whaling voyage. Vol. II, 1840, p. 23.

Echeneis scutata Günther, Ann. Mag. Nat. Hist. (3) V, 1860, p. 401. — Cat. Brit. Mus. II, 1860, p. 381.

Remilegia scutata Gill, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 239.

Remilegia australis Gill, ibid. 1864, p. 61.

Echeneis scutata Günther, Fische der Südsee II, 1876, p. 156.

Echeneis australis Waite, Trans. Royal Soc. S. Australia XXXIX, 1915, p. 340.

Remora scutata Munro, The marine and fresh water fishes of Ceylon, 1955, p. 268.

Remilegia australis Follett & Dempster, Proc. Calif. Acad. Sci. (4) XXXI, 1960, p. 169.

D^1. 24-28. D^2. 23-26. A. 23-26. P. 21-24. V. I. 5.

Height 7.3-7.7, 8.58-9.5 in length with caudal. Head 3.3-3.8, 3.9-4.4 in length with caudal .Eye 9-15. Suctorial disk with modally 26 pairs of laminae, ranging from 24-28 pairs. The disk is elongate oval, its breadth about 2.25-3 in its length, its posterior end far behind tip of pectorals. Lower jaw produced before upper jaw. "Dents en cils" present(?). Both jaws with a broad band of villiform teeth, and with an outer series of larger ones on the sides. Vomer and palatines with a continuous band of teeth, narrowest on the vomer. Scales minute. Origin of anal slightly before that of second dorsal, both fins ending in the same vertical. Pectorals rounded, ventrals slightly pointed. Caudal truncate. Colour bluish or bluish grey, brown in preserved specimens. Narrow light margins on each fin. Length 600 mm (Compiled, not seen by me).

Habitat: New Guinea (north coast) — Atlantic, Mediterranean, Indic and Pacific.

Note. The only record from the Indo-Australian Archipelago is a note of Myers (Copeia 1960 (1), p. 78) that this species is known from the north coast of New Guinea.

Order XENOPTERYGII

by John C. Briggs

University of Texas. Institute of Marine Science. Port Aransas *Texas* U.S.A.

Most modern ichthyologists agree that this highly modified group of fishes should remain separated at the ordinal level. This order seems to be most closely related to the Haplodoci but there is also some slight resemblance to the Callionymoidei. It may be considered a highly specialized divergence from a primitive percomorph stock. The characters which are common to all of the species are listed in the family description.

Family GOBIESOCIDAE

Adult size in standard length ranges from 16.7 mm. to about 300 mm. Anterior portion of head always more or less depressed. Lateral line present with pores well developed on head but small and difficult to locate posteriorly. No scales; a heavy coat of mucus exuded which becomes hardened on body when specimen is placed in preservative. Anterior nostril always tubular, posterior nostril usually so.

One dorsal and one anal fin. Ventral fins incorporated into a prominent, adhesive disc on ventral surface directly below junction of head and body. The four ventral rays form lateral edge of disc; last ray with membranous attachment to lower portion of pectoral base. Posterior to ventral rays, free edge of disc becomes extended dorsally behind pectoral fin to form axial, dermal flap. For descriptive purposes, surface of disc is divided into three different areas (fig. 97); region A anterior portion, region B posterior, region C central. The discs are of two basic types; "double" with small posterior disc separated from front portion by free, anterior edge; "single" with two parts coalesced into one continuous structure. Urogenital papilla present in both sexes just behind anal opening.

Pharyngeal teeth occur in three areas, two small, round patches on roof of pharynx and one V shaped cluster on pharynx floor. Dorsal areas supported by pharyngobranchial elements of second and third or (usually) third and fourth branchial arches. Ventral area extends from fifth branchial arch. Lachrymal usually present but rest of suborbital series missing. Entopterygoid and metapterygoid absent. Fenestra between preopercular and quadrate. Posttemporal long ,slender, unforked; it articulates with slender, rod-like

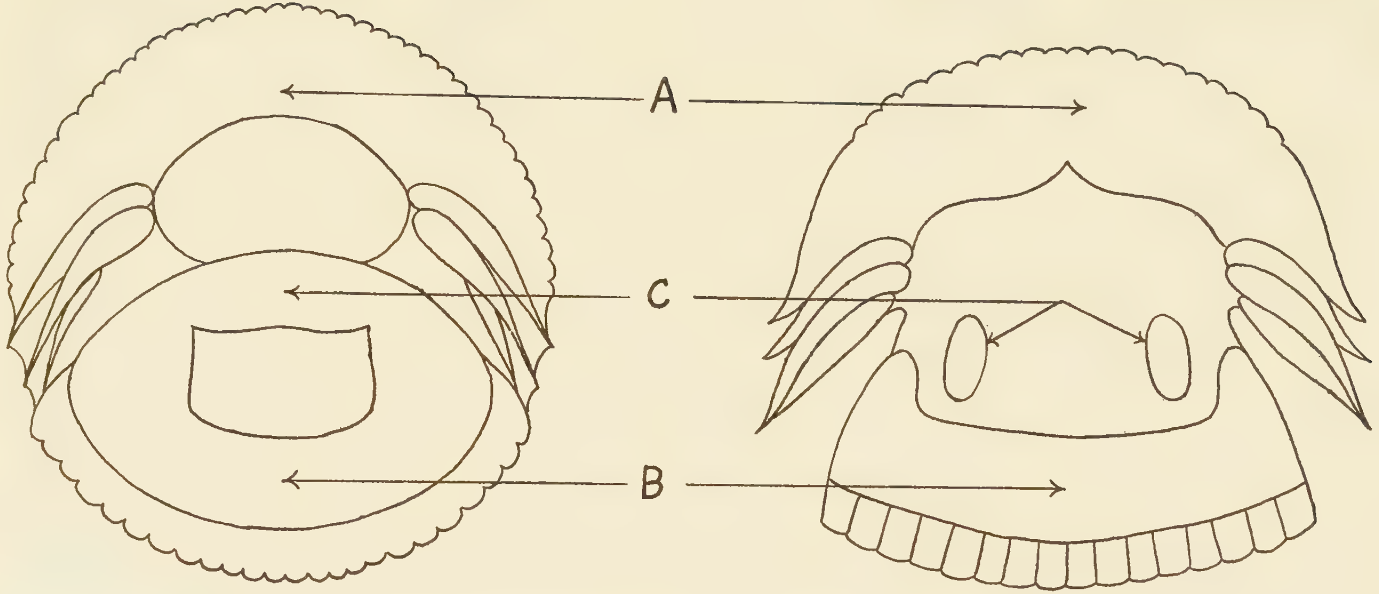

Fig. 97. Diagram illustrating disc regions in a double type disc (*Lepadogaster*, left) and a single type disc (*Gobiesox*, right)

supracleithrum. A pseudobranch (missing in genus *Gouania*) and 3 or 3½ gills. Gill rakers absent in one genus (*Liobranchia*) but vary in numbers and shape in others. 5 to 7, usually 6, branchiostegal rays.

Pectoral and pelvic bones highly modified for disc support. Ribs absent and replaced by sessile epipleurals. No spines in median fins and all fin rays unbranched. Vertebrae vary from 25-54. Family includes 8 subfamilies, 34 genera and 99 species with a cosmopolitan distribution in temperate and tropic waters. Apparently all species typically marine except six members of genus *Gobiesox* in New World. No fossil records have been found.

The various measurements were taken as indicated in the introduction to volume II of this series except for the following: The *length of the caudal peduncle* is measured from the base of the last anal ray to the midcaudal base. The depth of this structure is taken at the place of least vertical depth. The *diameter of the eye* is the horizontal length of the externally visible eye (this measurement is used rather than the diameter of the bony orbit because the lateral edges of the bony aperture are extremely difficult to locate in many of the species). The *interorbital space* refers to the bony interorbital distance which can usually be identified by pressing down the soft skin on the head. The *disc length* is the longitudinal distance between the outermost edges of the thin membrane which surrounds the heavier portions of the disc. The figures given for the number of caudal rays represent only the principal rays of that fin, those usually having noticeably free tips. The measurement referred to as the *dorsal-caudal* designates the distance from the dorsal origin to the midcaudal base. The term *postdorsal-caudal* refers to the space (between) the base of the last dorsal ray and the midcaudal base. The first pectoral ray tends to be very small in almost all of the genera and is easily overlooked.

Key to the Indo-Australian genera of Gobiesocidae

A. Gill membranes free from the isthmus. . . . 1. *Pherallodus* p. 447
B. Gill membranes attached to isthmus.
  a. Snout long and narrow, length 1.9-2.3 in head length; disc very small, length 7.9-9.7 in standard length; a row of incisors in lower jaw . . . . 2. *Diadamichthys* p. 448
  b. Snout comparatively short and broad, length 3.1-4.2 in head length; disc small, length 4.9-6.5 in standard length; a row of conical teeth in lower jaw . . . . 3. *Lepadichthys* p. 451

1. **Pherallodus** Briggs

(Briggs, Stanford Ichthy. Bull. 6, 1955, p. 43)

Very small Clingfishes with a slender body, rounded or a little depressed anteriorly and compressed posteriorly. Head slender and well depressed with a short rounded snout that is only slightly produced in dorsal outline. Head length 2.7-3.3 and width 3.9-5.4 in standard length. Nostrils on each side well separated and distinctly tubular. Upper lip comparatively narrow. A single row of compressed, incisorlike teeth in each jaw. In *P. smithi* the tips of the teeth are uniformly rounded while in *P. indicus* those at the front of jaws are pointed and those at sides notched with a shape similar to that seen in genus *Lepadichthys*. In upper jaw the points of these peculiar lateral teeth project backward while in lower jaw they extend in opposite direction. Second gill arch with 6 shallow rakers. Edges of gill membranes attached laterally close to pectoral base and well below upper origin of pectoral fin. No fleshy pad on lower pectoral base. Median fins comparatively short; dorsal rays 8-9, anal rays 5-7, and caudal rays 9-11. Pectoral rays 22-23. First anal and pectoral rays quite small and easily overlooked. Subopercular element evidently present and forms terminal bone posteriorly on side of head, not developed into a spine. Bony disc supports are characteristic in shape. Vertebrae 33. Branchiostegals 6.

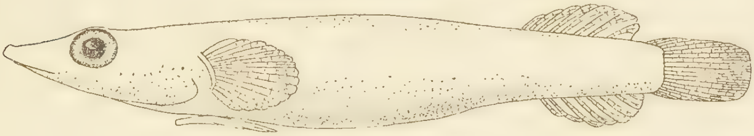

Fig. 98. *Pherallodus indicus* (Weber). After Weber.

Distribution: South East Africa to the Tuamotu Islands and north to Japan.

1. **Pherallodus indicus** (Weber) (Fig. 98, p. 447)

Crepidogaster indicus Weber, Siboga Exped. Fische, 1913, p. 525, fig. 111 (in part).
Pherallodus indicus Briggs, Stanford Ichthy. Bull. 6, 1955, p. 44 figs. 53, 77.

D. 8 (8-9); A. 6 (5-7); P. 23 (22-23); C. 10 (10-11).

Body small, slender, and compressed posteriorly, depth 7.1 (6.8-7.3) in standard length. Caudal peduncle medium, depth 1.4 (1.4-1.5) in its length. Anus located much closer to origin of anal fin than to rear margin of disc. Head narrow and depressed, length 3.2 (3.1-3.3) and width 5.3 (5.1-5.4) in standard length. Snout 3.5 (3.4-3.7) in head. Anterior nostril a simple, laterally compressed structure without a dermal flap on margin. Posterior nostril behind anterior edge of eye. Eye 0.6 in bony interorbital space and 3.8 (3.7-4.0) in head. Upper attachment of gill membrane opposite 9th (9-10) pectoral ray. Upper attachment of axial, dermal flap opposite 9th (8-10) pectoral ray. Postdorsal-caudal distance in dorsal length 3.6 (3.2-3.8). Dorsal-caudal distance measured forward extends to a point behind pectoral fin. Disc length 6.3 (5.6-6.7) in standard length; disc region A without any flattened papillae in its center; disc region B with 5 rows of flattened papillae across its width; 1 row of papillae across the width of disc region C. Maximum known size 28.7 mm. standard length. No pigment remains on any of the alcohol specimens. Weber (1913, p. 526) gives a brief account of the color of his freshly preserved material. He observed that the ground color was yellowish with a chalk-white stripe extending along the back from the tip of the snout, becoming indistinct posteriorly. There were, according to Weber, indications of faint, broad stripes behind and under the eye. The region between the eye and the tip of the snout was a pink color.

Habitat: Lesser Sunda Islands (Sumba Island!); Sula Islands (Sanana Island!). — Amami Islands (Kikai!), Tuamotou Archipelágo (Raroia Atoll!).

Note. The types of *Crepidogaster indicus* were borrowed from the Amsterdam Museum.

2. **Diademichthys** Pfaff

(Pfaff, Vidensk. Medd. fra Dansk. Naturh. Foren. 105, 1942, p. 413)

Body slender and well compressed posteriorly, rounded and only slightly depressed anteriorly. Head narrow with a long, slender, spatulate snout. Mouth small and inferior and upper lip small and indistinct. Nostrils on each side widely separated and tubular. Both jaws with a single row of incisors, those at very front narrow and trifid, becoming broad with pointed, reverse tips along sides. Second gill arch with 10 narrow, sharp rakers. Edges of gill membranes attached well in front of pectoral base and considerably below upper origin of pectoral fin. No fleshy swelling or pad on lowest part of pectoral base. Dorsal and anal fins are long and attached to caudal. First pectoral ray is very small and likely to be overlooked. Disc is very small and rounded, pattern of flattened papillae on ventral surface similar to that found in *Lepadichthys*. Subopercular element present and forms terminal bone posteriorly on side of head, not developed into a spine. Bony disc supports are characteristic in shape. Vertebrae 37. Branchiostegals 6.

Distribution: Indian Ocean; Indo-Pacific north to Philippines.

1. **Diademichthys lineatus** (Sauvage) (Fig. 99, p. 450)

Crepidogaster lineatum Sauvage, Bull. Soc. Philom. Paris 7, 1883, p. 158. Fowler, Mem. Bishop Mus. 10, 1928, p. 447.

Diademichthys deversor Pfaff, Vidensk. Medd. fra Dansk. Naturh. Foren. 105, 1942, p. 413, pl. 3, figs. 1-3.

Coronichthys ornata Herre, Stanford Ichthy. Bull. 2, 1942, p. 120, Fig. 1.

Diademichthys lineatus Whitley, Austr. Mus. Mag. 10, 1950, p. 127, Fig. 4. Rec. Austr. Mus. Sydney 22, 1951, p. 404, fig. 10. Briggs, Stanford Ichthy. Bull. 6, 1955, p. 141, fig. 81, 114.

D. 14 (13-15); A. 13 (12-14); P. 26 (25-26); C. 13 (12-14).

Body slender and compressed posteriorly, depth in males 10.3 (9.7-10.7) in females 11.8 (11.2-12.9), both in standard length. Caudal peduncle short, depth 0.7 (0.6-0.8) in its length. Anus located much closer to origin of anal fin than to rear margin of disc. Head narrow and well depressed, length in males 3.0 (2.8-3.1), in females 2.5 (2.4-2.5), and width 8.0 (7.6-8.4) all in standard length. Snout in males long, 2.2. (2.2-2.3) in head; snout in females longer, 1.9 (1.9-2.0) in head. Anterior nostril a simple structure without dermal flap on the margin. Posterior nostril in front of anterior edge of eye. Eye in males 0.6 (0.4-0.7) in bony interorbital space and in females 0.3 in this space. Eye 5.4 (5.0-5.9) in head (both sexes). Upper attachment of gill membrane opposite 9th (8-10) pectoral ray. Upper attachment of axial, dermal flap opposite 14th (12-15) pectoral ray. Postdorsal-caudal distance in dorsal length 3.6 (3.2-3.8) Dorsal-caudal distance measured forward extends to a point well behind the pectoral fin. Disc very small, length 8.7 (7.9-9.7) in standard length; disc region A with 4 rows of flattened papillae across its width; disc region B with 5 (4-6) rows of papillae across its width; no papillae in disc region C. Maximum known size 46.2 mm. standard length.

The specimens available had all been in alcohol a number of years and were almost completely colorless. Fortunately, Pfaff (1942, p. 415) has given good descriptions of both live and freshly preserved specimens as follows: "Color of male holotype in alcohol reddish, eventually turning to reddish yellow or pale yellow, the

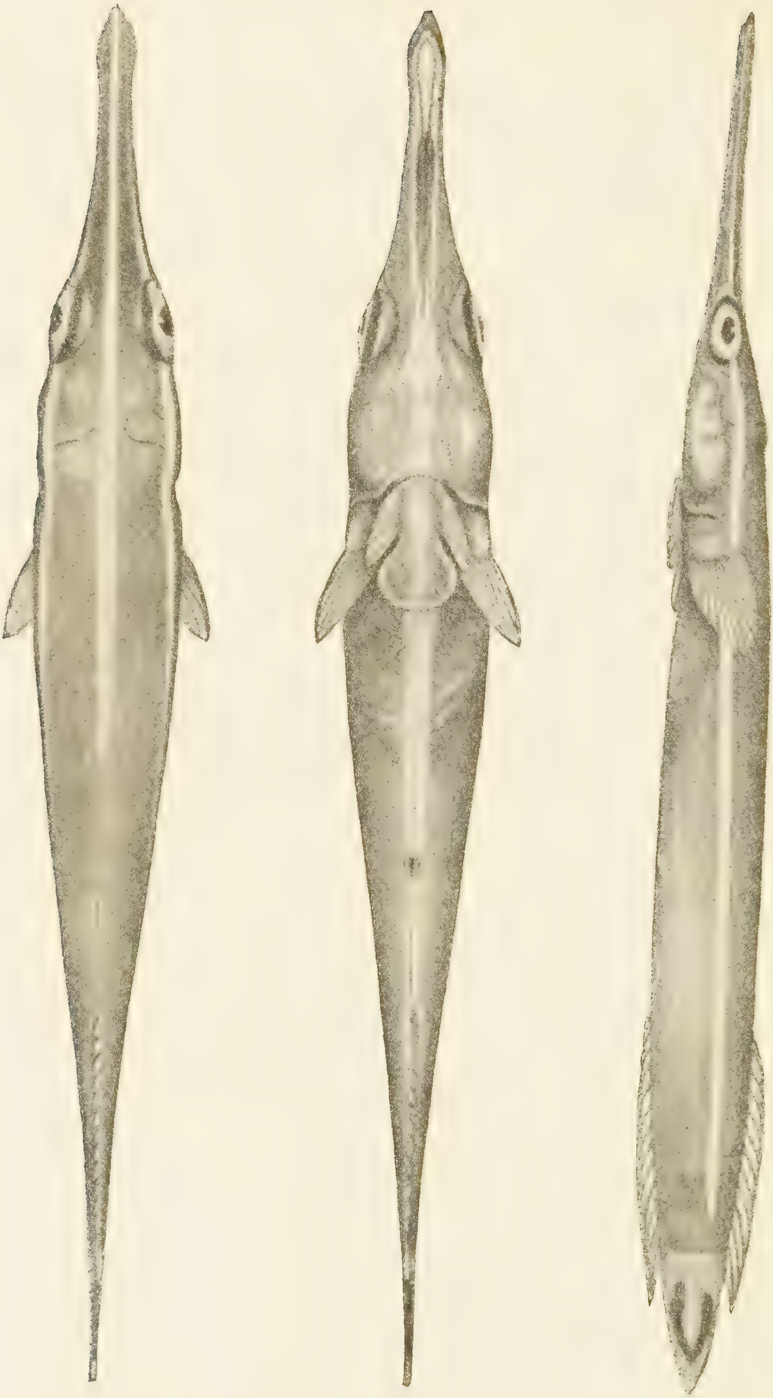

Fig. 99. *Diademichthys lineatus* (Sauvage). After Herre.

original red color only being kept as a horizontal streak through the eye. Four clear white lines adorn the body. A dorsal line runs from the tip of the snout to the origin of the dorsal, from which point it is continued for some distance at the base of the fin. A side-line originates a short distance before the eye, runs through the upper part of the eye itself, continues along the side a little nearer the dorsal than the ventral line and terminates in a small white spot at the base of the caudal fin. A white ventral line originates just behind the disc and continues to the base of the anal fin. Fins without markings except the caudal, which has a faint yellowish, crescentic mark. Color in life was black ,with bright white lines, the black color immediately turning to red when the fish is put into alcohol. The color in the allotype female nearly as in the males. The white side-line, however, stops at a short distance before the root of the caudal, which place carries a little white, crescentic spot."

Habitat: :Jakarta Bay!; Java Sea (Onrust!) — Mauritius; Philippines (Busuanga Island!); New Caledonia!.

Note. Type of *Crepidogaster lineatum* examined at Paris Museum. Paratype of *Diademichthys deversor* borrowed from University Museum, Copenhagen. Type of *Coronichthys ornata* examined at Stanford University.

3. **Lepadichthys** Waite

(Waite, Rec. Austr. Mus. Sydney 5, 1904, p. 180)

Body slender and moderately depressed anteriorly. Head slender with a short, rounded snout somewhat produced in dorsal outline. Head length 2.7-3.2 and width 4.2-5.4 in standard length. Nostrils on each side well separated and distinctly tubular. Upper lip comparatively narrow, may be slightly wider at sides of snout than at front. A single row of teeth in each jaw. In upper jaw teeth are highly compressed with reverse points. None are present at very tip of jaw since premaxillaries fail to meet at this point. Only small, pointed conical teeth are found in lower jaw. Second gill arch with 5-16 rakers. Edges of gill membranes attached laterally close to pectoral base and well below upper origin of pectoral fin. No fleshy pad on lower pectoral base. Dorsal and anal fins comparatively long and attached to caudal. Dorsal rays 9-17, anal rays 8-15, pectoral rays 25-31, and caudal rays 10-14. First dorsal and pectoral rays are very small and easily overlooked. External structure of disc similar to that of *Diademichthys*. Subopercular element present and forms terminal bone posteriorly on side of head, not developed into a spine.

Bony disc supports are characteristic in shape. Anterior portions of paired premaxillaries perforated by a large median opening. Vertebrae 34-37. Branchiostegals 6.

Distribution: Indian Ocean; Indo-Pacific to Japan.

1. **Lepadichthys minor** Briggs (Fig. 100, p. 452)

Crepidogaster indicus Weber, Siboga Exp. Fische, 1913, p. 525 (in part).
?*Diplocrepis costatus* (*non* Ogilby) Whitley, Rec. Austr. Mus. Sydney 15, 1927, p. 304.
Crepidogaster samoensis (*non* Steindachner) Fowler and Sylvester, Marine Pap. Carnegie Inst., 1922, p. 124. Fowler (*non* Steindachner), Mem. Bishop Mus. 10, 1928, p. 447.
Gobiesocidae Koumans, Temminckia 9, 1953, p. 261.
Lepadichthys minor Briggs, Stanford Ichthy. Bull. 6, 1957, p. 137, fig. 113.

D. 10 (9-10); A. 8; P. 28 (27-29); C. 12.

Body slender and well depressed anteriorly, depth 6.4 in standard length. Caudal peduncle short, depth 0.8 (0.8-0.9) in its length. Anus located about halfway between origin of anal fin and rear margin of disc or else slightly closer to latter structure. Head narrow and depressed, length 2.8 (2.7-3.0) and width 4.4 (4.3-4.5) in standard length. Snout in dorsal outline short and rounded, 3.9 (3.7-4.2) in head. Anterior nostril with a minute, simple, dermal flap extending from posterior margin. Posterior nostril located just behind anterior edge of eye. Eye 0.7 (0.6-0.7) in bony interorbital space and 3.7 (3.4-3.9) in head.

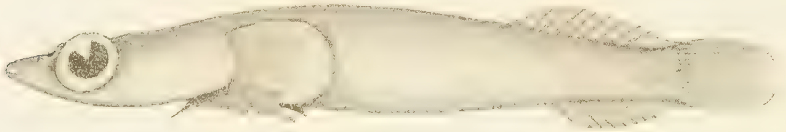

Fig. 100. *Lepadichthys minor* Briggs.

Upper attachment of gill membrane opposite 12th (12-13) pectoral ray. Upper attachment of axial, dermal flap opposite 11th (10-12) pectoral ray. Postdorsal-caudal distance in dorsal length 2.2 (2.0-2.4). Dorsal-caudal distance measured forward extends to a point located behind distal end of pectoral fin. Disc small, length 5.1 (5.0-5.3) in standard length; disc region A with 3 rows of flattened papillae across its width; disc region B with 5 rows of papillae across its width; no papillae in disc region C. Maximum known size 21.8 mm. standard length.

Alcohol specimens colorless. Fortunately Koumans (1953,

p. 261) described the coloration in his report on the Snellius Expedition specimen. "It is in spirits dark purple, snout a little lighter, belly and throat whitish. A number of white lines on head and body: A median one from tip of snout over back to base of dorsal fin. On each side a more narrow line from tip of snout through upper part of eye back to upper part of caudal fin. On lower side on each side from symphysis of lower jaw a narrow line along lower margin of eye to anal fin."

Habitat: Celebes Sea (Muaras-Riff!); Ceram Sea (Obi Latu!) — New Caledonia; New Hebrides (Epi!); Samoa (Pago Pago!).

Note. Type of *Lepadichthys minor* designated from material borrowed from Amsterdam Museum.

CORRIGENDA

p. 5. In stead of "**Phenacoscorpius**" read "1. **Phenacoscorpius**".

p. 39. In key and p. 48 in synonymy in stead of "*Brachirus*" read "*Brachiurus*".

p. 176. In synonymy read "*Ebisinus*" in stead of "*Ebisimus*".

p. 209. In 22nd line from bottom read "*Commersonii*" in stead of "Commersonii".

p. 211. In 5th line from top read "*moluccensis*" in stead of "*molluccensis*".

p. 226. In key read "*D. brevicaudatus*" in stead of "*D. brevicaudata*".

p. 242. In 4th line from bottom read "*Melanocetus*" in stead of "*Melanocerus*".

p. 258. In 6th line from bottom read "*Shufeldti*" in stead of "*Schufeldti*".

p. 259. In key read "*Linophryne*" in stead of "*Linaphryne*".

p. 297. In 4th line from bottom read "*Balistes*" in stead of "*Balistus*".

p. 315. In 9th line from bottom read "*Chaetodermis*" in stead of "*Chaetoderma*".

p. 316. In key read "*sandwichiensis*" in stead of "*sandwichensis*".

p. 326. In stead of "**nemathophorus**" read "**nematophorus**".

p. 327. Add "12". before "**Monacanthus sulcatus**".

p. 327 In last line of synonymy read "*Arotrolepis*" in stead of "*Astrolepis*".

p. 328. In 4th line from top read "*Arotrolepis*" in stead of "*Astrolepis*".

p. 376. In key read "*alboplumbeus*" in stead of "*alboplumeus*".

p. 391. At bottom add "5." before "**Tetraodon**".

p. 424. In key read "*Macrognathus*" in stead of *Macroganthus*".

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1) A comprehensive book is: "Local Common Names of Indonesian Fishes" by W. H. Schuster and R. Rustami Djajadiredja, published for the Ministry of Agriculture of Indonesia, Laboratory for Inland Fisheries by N. V. Penerbit W. van Hoeve-Bandung, 's Gravenhage 1952.

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